Carbon, complexity and insurance

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Abstract
The purpose of this paper is to look at the insurance needs of the carbon market. The carbon market is an artificial market created under the Kyoto Protocol to trade emissions reductions.

The aim of the carbon market is to reduce anthropogenic carbon emissions to mitigate against dangerous climate change. The first part of the paper gives a description of the market. Drawing on complexity economics, I then go on to argue that the markets are likely to be of limited success in achieving their aims.

The paper then describes how carefully designed insurance products, such as a delivery wrap or a carbon cat bond, could improve the effectiveness of the market by reducing investment risk and hence enhancing capital flows into carbon abatement projects.

Keywords
Climate change, carbon trading, Clean Development Mechanism, insurance, complexity economics, emissions targets, basis risk

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Introduction

Recently there has been considerable interest on the implications of climate change for the insurance industry. Much of this is concerned with the negative impact of climate change on the industry, which could have the effect of increased property claims in certain areas, increased unpredictability, higher cost of capital, claims from unexpected areas (for example D&O claims), impacts on assets and reduced new business amongst other impacts[1].

This paper approaches the subject from a different angle. The threat of global warming is causing society to shift resources to mitigate the effects of global warming which has created a new market in which the insurance industry can play an important role. The new market, often referred to as the carbon market, is regulatory driven and highly complex. To examine the potential role of insurance, this paper gives an overview of the market for the interested actuary or non-life practitioner. The paper also gives a brief critique as to why the market may not achieve its desired aims of sufficiently limiting anthropogenic greenhouse gas emissions to avoid dangerous climate change.

This paper falls into 3 parts the first part gives an overview of the carbon market. The second part explores the limitations of these markets in achieving their aims, whilst the third part looks at which risks in these markets are insurable and the potential role for the non-life insurance industry.

1 The Carbon Market

The carbon markets are regulatory created markets, the aim of which are to facilitate efforts to mitigate anthropogenic climate change. The science of climate change and its effects have been dealt with in great detail elsewhere, I refer the interested reader to The International Panel on Climate Change (IPCC) AR4 synthesis report[2] or the HM Treasury's Stern review[3] for summaries of the science and economic implications. However, I will give the briefest of summaries as an introduction.

Climate Change – a parsimonious introduction

Climate scientists have noted that the average global temperature has increased by more than 0.6 degrees centigrade over pre-industrial levels, and predict that the world will get hotter, which will cause a number of malevolent affects, some of which could be potentially disastrous. The cause of this warming are so called greenhouse gasses (GHGs), mainly carbon dioxide, but also – and often forgotten a number of other gasses such as methane and nitrous oxide – which are produced mainly as a result of burning fossil fuels for energy, but also in other industrial processes and in agriculture[4]. The potentially malevolent affects include:

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[1] For a good summary see Bruce et al (2007) and http://climatechange.pbwiki.com for other references. Also see Mills and Lecomte (2006) and Muir-Wood (2005)
[2] IPCC (2007), IPCC (2007a) and IPCC (2007b) – also see http://www.ipcc.ch/ for the other reports
[3] Stern (2006)
[4] IPCC (2007)

1. Hotter global temperatures – the increase will not be uniform, for example temperature increases at the poles are likely to be more extreme
2. Changed rainfall patterns which could lead to widespread drought and flooding
3. Increased salinity of oceans threatening marine wildlife and hence livelihoods
4. Melting of inland glaciers causing changes to alpine landscapes and river flooding followed by reduce flow of many major rivers
5. Increased risks and severity of severe weather events such as North Atlantic hurricanes
6. Sea level rises caused by expansion of oceans
7. Melting of Greenland and Antarctic glaciers causing potential catastrophic rise in sea level[5].

The higher the concentration of GHGs in the atmosphere, the higher the probability of positive feedback effects – for example the "albedo" flip (if the artic ocean melts, the sea absorbs heat rather than reflects it), the burning of tropical rainforests (reduced rainfall and higher temperatures increases could render tropical rainforests unsustainable; they will then burn releasing further carbon into the atmosphere) and the release of methane from permafrost (if the arctic permafrost melts, methane – a powerful greenhouse gas - will be released in large quantities into the atmosphere)[6].

International abatement agreements

In an attempt to avert the damaging consequences of climate change, many governments have agreed that there is a need for reduced GHG emissions. They have also recognised that developing countries are not the cause of global warming – but will suffer the brunt of the effects – for example many developing counties will face reduced rainfall & hence crop yields with potentially disastrous effects (whereas countries like Canada & Russia may benefit from increased crop yields.)[7]

However, it has been accepted that these countries must be allowed to develop, so two key concepts are enshrined in the negotiations, namely to divert carbon finance to developing countries – for example for sustainable energy projects, and to provide funds for adaptation[8].

In an effort to avoid the potential disastrous effects of global warming, practically all governments signed the United Nations Framework Convention on Climate Change (UNFCCC) in Rio de Janeiro in 1992. The UNFCCC is aimed at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

The signatories of the treaty (practically all countries) meet every year at an official meeting (called a conference of parties ("COP") or meeting of parties ("MOP")) with the aim of developed countries restoring their 1990 level of emissions, and helping developing countries with clean technology and adaptation. In 1997 the Kyoto protocol was signed – again by practically all countries in the world. This has now been ratified by 182 parties – noteable exceptions being Turkey and the USA (though both of these are likely to ratify within the next two years). Under the Kyoto protocol,

[5] IPCC (2007b)
[6] See Hansen et al (2007) for further information on positive feedback
[7] IPCC (2007b)
[8] Stern (2006)

developed countries agree to reduce their GHG emissions by 5.2% below 1990 levels. Developing countries have no obligations except to monitor emissions. Kyoto came into force in 2005 and runs until 2012.

Under the Kyoto protocol, although countries agree to reduce their GHG emissions, they are allowed to trade; if targets are not met, they can buy emissions reductions from others who have bettered their targets –so called flexible mechanisms. Emissions reductions can be traded at both the country level and company level; each country allocates emissions permits to companies within the country, who therefore have reduction targets. These companies can trade their permits.

Assigned Amounts Units (AAUs) are the country level permits that can be traded. The European Union Emissions Trading Scheme ("EUETS") is the main company level trading system, the units being bought and sold are called EUETS. This system is called a cap and trade system[9] and applies to Annex 1 countries (i.e. developed countries). These countries have agreed to a target, but are allowed to trade the right to emit[10].

Clean Development Mechanism (CDM) and Joint Implementation (JI)

The other system instigated by the Kyoto Protocol is is a baseline and credit regime. Developing countries (non Annex 1 countries) have no mandatory target, so the only way of getting carbon finance to them is on a project basis. A project has to demonstrate that it produces emissions reductions from what would have happened anyway. There are two kinds of projects – Clean Development Mechanisms (CDMs) and Joint Implementation (JIs). JIs are in Annex 1 (normally but not exclusively former Soviet Bloc countries), CDMs are in other developing countries. JIs and CDMs are for all intents and purpose the same, albeit with different compliance frameworks. The units of carbon produce by JIs are called Emissions Reductions Units (ERUs) and CDMs Certified Emissions Reductions (CERs). CERs/ERUs and EUAs are different currencies - like the pound or dollar - denominated in tonnes of CO_2 equivalent[11].

The key concept is that GHG emissions are reduced in one country to permit an equivalent quantity of GHG emissions in another country without changing the global emissions balance. And as I have already mentioned, the CDM is a baseline and credit trade mechanism. The idea behind CDMs are that reductions are cheaper in developing countries, and it will encourage clean technology investment and technical expertise in these countries, helping them to leapfrog carbon intensive development.

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[9] A central authority (usually a government or international body) sets a limit or *cap* on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of *allowances* (or *credits*) which represent the right to emit a specific amount. The total amount of allowances and credits cannot exceed the cap, limiting total emissions to that level. Companies that need to increase their emissions must buy credits from those who pollute less. The transfer of allowances is referred to as a trade. In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions by more than was needed. Thus, in theory, those that can easily reduce emissions most cheaply will do so, achieving the pollution reduction at the lowest possible cost to society (Montgomery (1972))

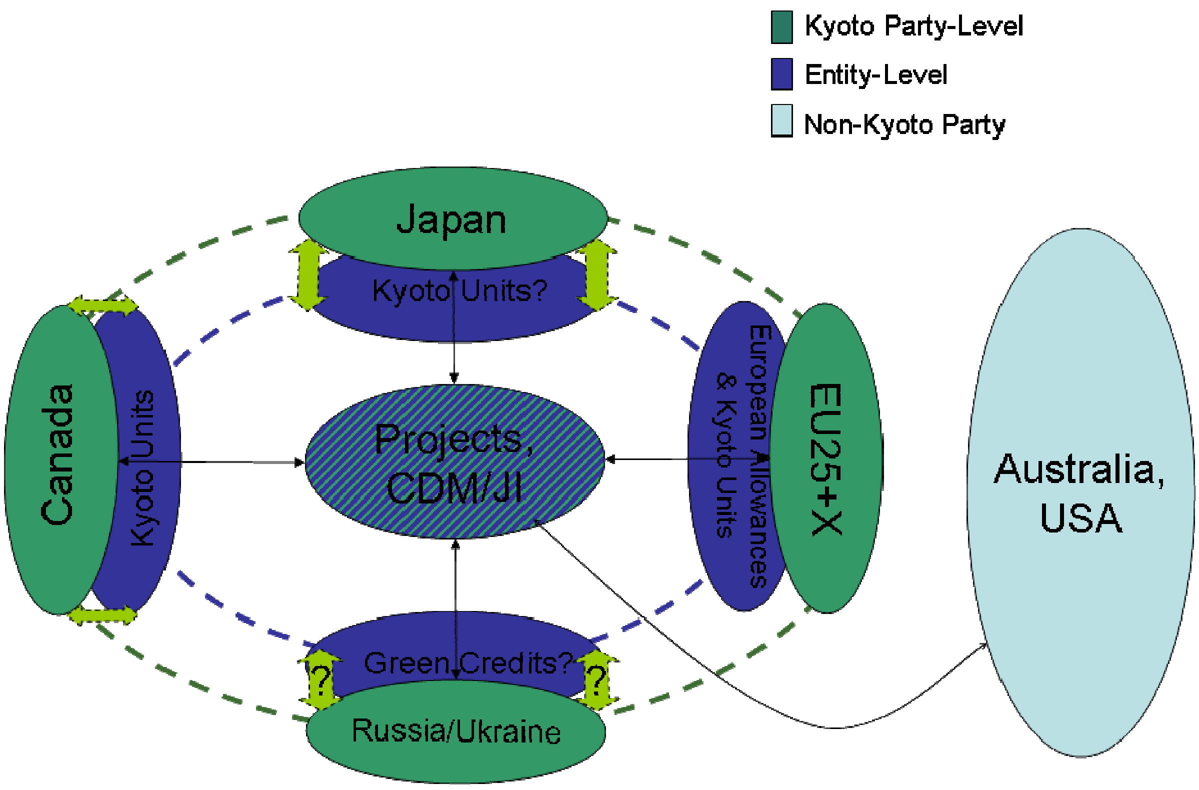
[10] United Nations (1998)

[11] IPCC (2007c)

Emissions reductions under CDMs and JIs must demonstratably create real, measureable and long term benefits to the mitigation of climate change and be additional to any that would occur in the abscence of certified project activity[12].

The “official” carbon market described above is totally different to the “voluntary” market, which has received a lot of bad publicity. Figure 1 illustrates how the different trading systems all fit together.

Figure 1 Global GHG Market[13]



The CDM/JI Market

Figure 2 shows where the projects are being set up and which countries are buying credits from them. This shows that almost 2/3rds of projects (by volume) are in China. This is beacuse of the size of the market, but also because China has been very efficient in setting up a carbon infrastructure. Also suprising is the small number of projects in India – although this is rapidly changing. Brazil is another big growth area. The pie on the right shows the buying market, with the UK a clear leader. This reflects that London is the centre of the carbon finance market. Maybe the most

[12] United Nations (1998)
[13] From www.ieta.org

important country in this chart is the USA – at the moment the world's largest emitter is absent. But both presidential candidates are commited to ratifying Kyoto and therefore the inaugaration of the next president in 2009 could see exponential growth in CDMs.

Figure 2 Distribution of projects by buye and seller[14]

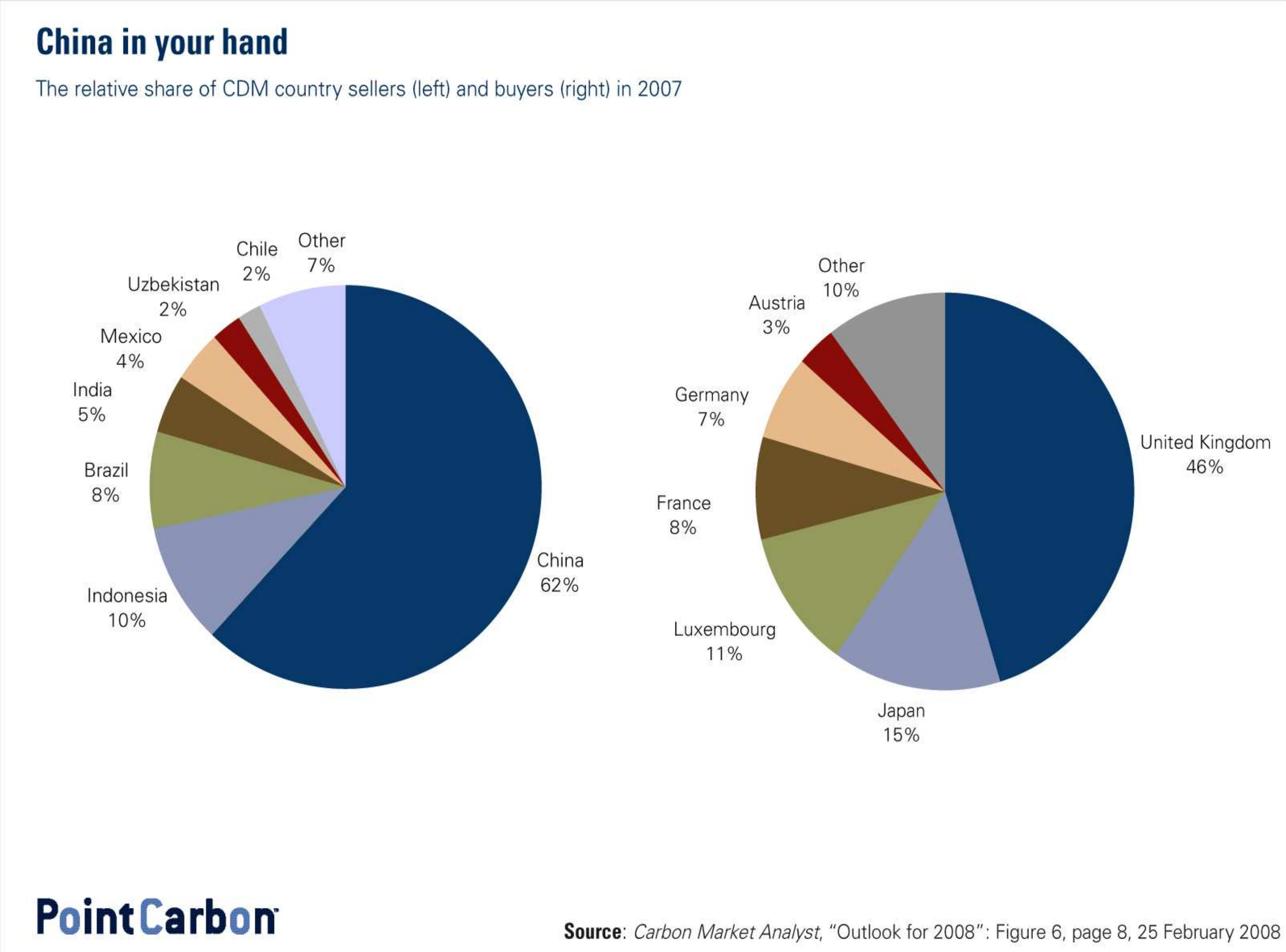


Figure 3 shows the massive growth in the market rising to a projected 2,600 million tonnes of CO2 equivalent in 2008 (at €20 per tonne – the size of the market is apprximately €50bn.)

Figure 4 shows the make up of CDM projects by type. The biggest group, as might be expect are energy generation projects. These are mostly traditional technology such as combined cycle gas power station or hydro-electricity. Fugitive emissions are projects using fosil fuels, such as gas capture and flaring. Waste handling and disposal tend to be much smaller scale such as composting or methane flaring from landfill sites. Only 1 project registered so far is in forestry – this reflects the difficulty of the procedure. It is s expected that the successor to Kyoto will include some kind of

[14] Point Carbon (2008)

finance for forestry – this could be a potential area for future insurance, there are a few companies looking at this.

Figure 3 Growth in CDM Market[15]

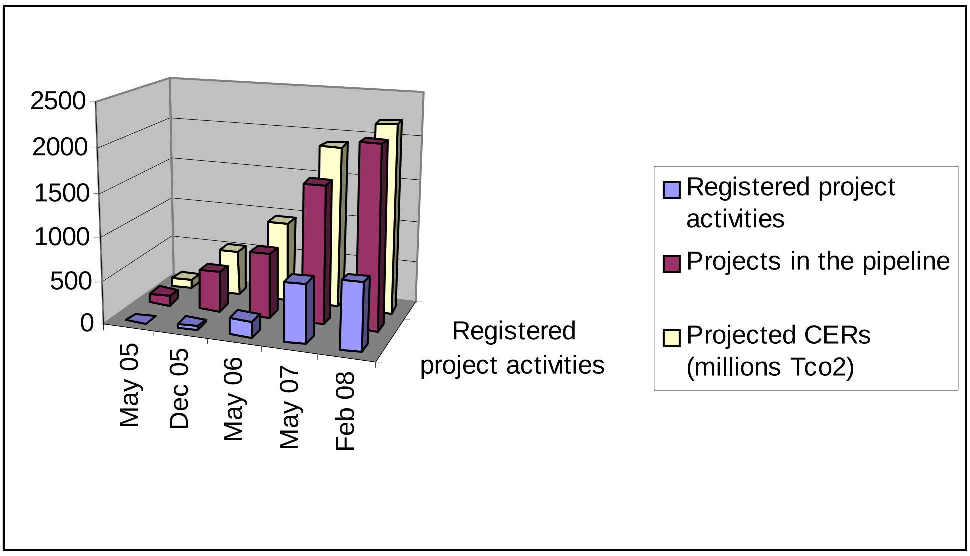
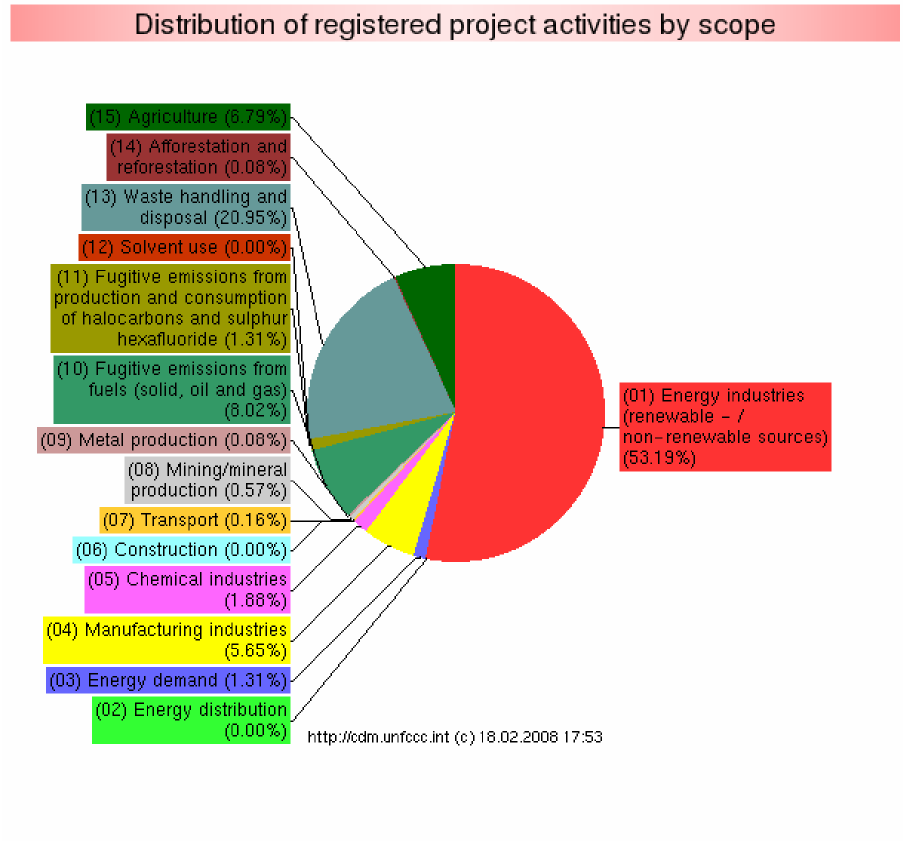


Figure 4 CDM projects by type[16]



Sectoral Scope*	Registered Projects
(01) Energy industries (renewable - / non-renewable sources)	650
(02) Energy distribution	0
(03) Energy demand	16
(04) Manufacturing industries	69
(05) Chemical industries	23
(06) Construction	0
(07) Transport	2
(08) Mining/mineral production	7
(09) Metal production	1
(10) Fugitive emissions from fuels (solid, oil and gas)	98
(11) Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	16
(12) Solvent use	0
(13) Waste handling and disposal	256
(14) Afforestation and reforestation	1
(15) Agriculture	83

* Note that a project activity can be linked to more than one sectoral scope

[15] Source www.unfccc.int
[16] ibid

To qualifya s a CDM, a project has to pass strict requirements, including the following:

1. Commercially viable technology
2. Adequate ERs volume
3. The ER volume must be big enough to make a project viable under the CDM -- for example, a small-scale project should generate a minimum threshold of 30,000 tonnes CO2/year.
4. Demonstration of additionality and determination of baseline Scenario and Emission Reductions
5. Competent Project participants and clear institutional arrangement with technically experienced and sound project developers with clear division of functions.
6. Viable business and operation model that help reduce transaction costs
7. Sound financing structure
8. Ratification of Kyoto Protocol by the Host Country
9. Environment impact and sustainability of the project
10. Contribution to Sustainable Development

Once the project is up and running, emissions reductions have to be validated by an independant approved private sector organisation to meet the appropriate criteria.

2 Limitations of the carbon markets – a personal view

Section 1 gave a brief overview of the carbon market. This section briefly introduces the economic theory behind the market before discussing the market's limitations and why they are unlikely to achieve their goal of sufficiently reducing the risk of anthropogenic climate change. In this section, I shall draw on a relatively new branch of economics called complexity economics, or agent based modelling which has been the subject of a recent paper on its implications for actuarial theory[17].

The carbon market described above is unusual in being an artificial markets derived straight from the economic theory, so if the theory is wrong, the systems have no theoretical basis.

Economic rationale

The theoretical justification for emissions trading can be characterised as follows: economic transaction sometimes result in an externality, that is a cost or benefit borne by a third party who is not part of the transaction. Carbon emissions are a classic case of an externality, a power station (for example) burns fossil fuels to produce electricity but also produces greenhouse gasses, which damage the atmosphere and harm third parties (future generations, small island states, etc), but do very little direct

[17] Palin et al (2008)

damage to the company producing the gasses. So, when a power company decides how much power to produce, and hence how much carbon to emit, it sets the production level so that the cost of an extra unit of production equals the market price, without allowing for the extra cost borne by society.

There are two standard economic recommendations for policy makers to solve this problem; firstly to set a tax so that the cost to the company equals the companies' cost plus the cost to society (and it is no simple task to calculate what the level of the tax should be). The other alternative is the cap and trade system. This derives from Coase theorem, a standard of economic theory. The theorem states that when trade in an externality is possible and there are no transaction costs, bargaining will lead to an efficient outcome regardless of the initial allocation of property rights. All the government has to do is set a socially optimum level of emissions (the cap) and allow companies to trade[18].

There are at least three things wrong with the application of Coase theorem to carbon abatement.

Transaction costs
Firstly the statement "there are no transaction costs" is clearly unacheivable, even to a close approximation. The problems of allocating emissions permits (under EUETS) or CERs or ERUs (under JI or CDM), in a multitude of different countries and for wildly different methodologies – from forestery to state of the art renewable technology - is immense, and anyone who has had anything to do with the systems that have been developed would readily attestify to the complexity catastrophe that has resulted.

Socially optimal targets
Secondly the government's ability to set a socially optimal level of emissions is highly questionable: even knowing what this level might be is fraught with difficulty; whilst there is scientific concensus that climate change is occurring, scientists estimate of the effect of emissions is constantly changeing as their models improve, and the value of the damage caused by those emissions is highly uncertain and perhaps even unknowable.

This can be demonstrated by the difference in opinion over targets. Whilst CO2 is produced in by far the largest quantities, tonne for tonne, the other gasses have much more powerful greenhouse effects; this often causes what I feel is a deliberate fudge – for example to stop the world from warming by more than 2 degrees – a target which is generally agreed will stop the more potentially catastrophic effects - we need to keep the CO2 equivalent in the atmosphere to less than 440 parts per million (ppm) compared to current levels of 380. However, if you include the non-CO2 GHGs the level is already at 440 ppm – something that seems to be conveniently forgotten[19]. This confusion can be illustrated by looking at the work of 3 prominent authorities:

Grantham Research Institute[20]
The most recent report (authored by from Nick Stern, chairman of the Stern review[21]) recommends a stabilization target for greenhouse gases of 450-500ppm of CO2

[18] Myles (1995)
[19] Monbiot (2006)
[20] Stern (2008)

equivalent (compared with 450-550ppm in the 2006 Stern review). In the 2006 Stern review, other greenhouse gases made up 50ppm of the target, so 500ppm CO2e = 450ppm CO2[22].

David King[23]
David King now recommends a target of 450ppm CO2e - anything higher than this is an unacceptable risk. However, the stabilization at 450ppm is virtually certain to miss the target of no more than 2 degrees of warming[24].

Godard Institute
The latest report recommends that the stabilization target should be 350ppm of CO2. (Adding in other greenhouse gases as per Stern this equates to about 400ppm CO2e.) 350ppm is significantly below the level in the air now, but the report argues that it is still possible to achieve this with the maximum possible effort, because the oceans will continue to absorb CO2 for many years[25].

Converting the Stern and King targets into CO2 alone, we then have 3 targets, 450ppm, 400ppm or 350ppm of CO2. Given this difference amongst prominent experts, there is a different order of magnitude of uncertainty over what the socially optimum level might be. Furthermore, even if "government" did know what the socially optimum level was, setting it might be another problem given the large interests who have a lot to lose from switching to a decarbonized economy. And of course, climate change is a global problem and no world government exists to set the non-existant socially optimum level of emissions.

Economic flaws
Finally, there is the word "efficiency" – a word of immense importance to traditional economics, but which actually has little use in the real world.

A new branch of economics is emerging which challenges the received wisdom of "traditional economics", and if correct will invalidate many of the traditional theories such as Coase theorem. This approach questions the assumptions, models and results of traditional economics[26].

Traditional Economics is based on the assumption that people behave with perfect rationality. Every decision is based on complex constrained "utility-maximising" calculations (how much pleasure do I get from buying this bunch of bananas given all the other possible combination of goods that I could buy now and in the future, and given my current and future income). The way we think today evolved to help us survive in the wild – so we are clearly not perfectly rational – if we were our ancestor would have all been eaten by the first lion that came along while he was trying to deduce whether or not it would give him greater utility to run away. Instead we have

[21] Stern (2006)
[22] ibid
[23] Former chief scientific advisor to UK government
[24] King (2008)
[25] Hansen ate al (2008)
[26] See Beinhocker (2007) for an excellent popular introduction to the subject. See also Mandlebrot and Hudson (2006) for a critique of traditional economics, Palin et al (2008) for implications fro actuaries and Miller and Page (2007) for description of complex adaptive systems.

evolved to very quickly recognising patterns (teeth + claws = predator, therefore run). This subjects us to certain predictable biases, for example we recognise patterns even when they don't exist (house prices going up, therefore they will continue to do so). With real life non-rational humans, markets are not "efficient" as required by Coase theorem. The efficient market hypothesis asserts that prices on traded assets reflect all known information and therefore are unbiased estimates of the value of the underlying asset. In reality non-rational traders seeking profit from speculation drive asset prices, which can vary widely from the underlying value by for long periods of time[27].

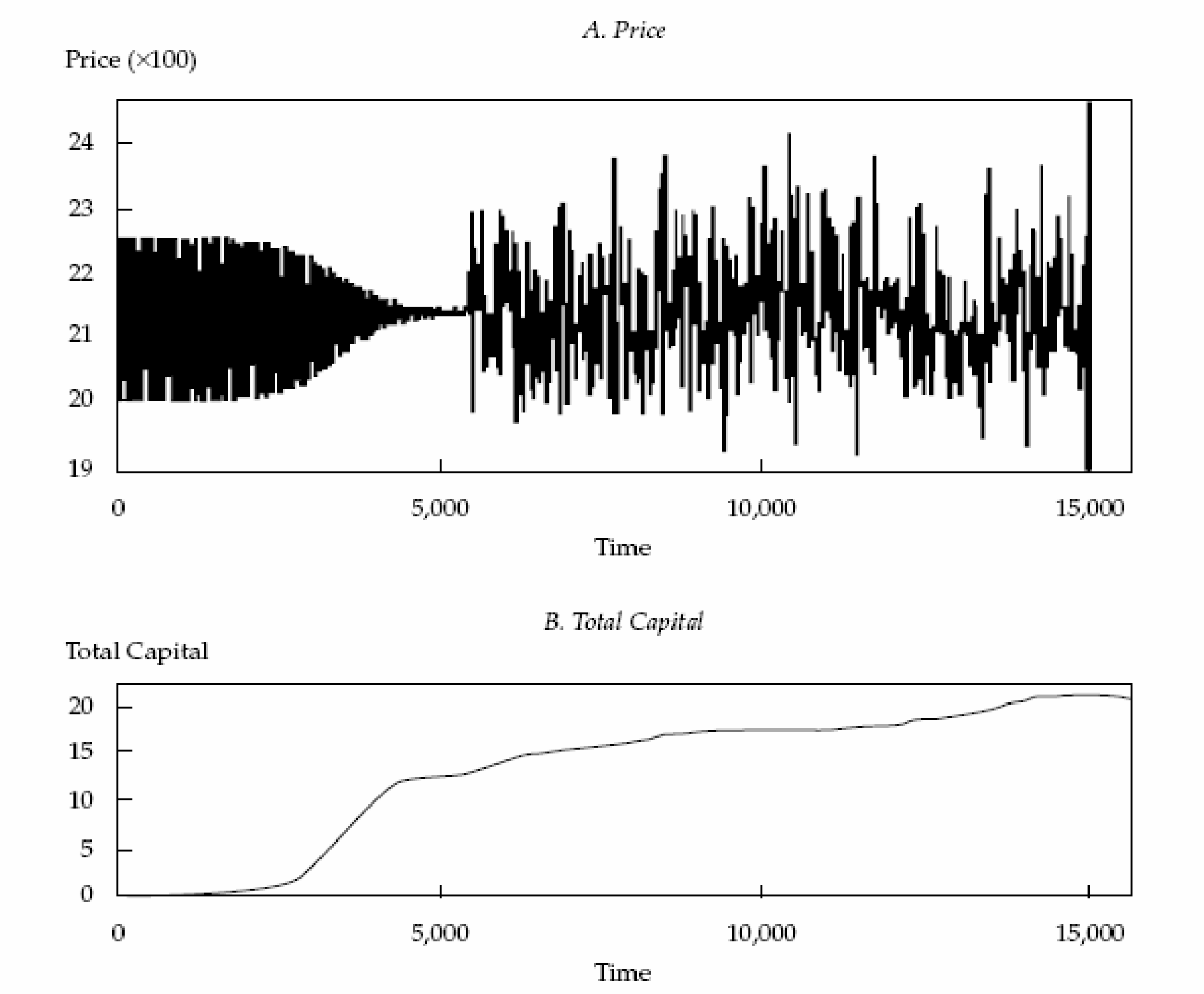
The main entities producing emissions are not even utility maximising individuals, but large corporations such as power companies. Traditional economics' has little further insight into company behaviour beyond they seek to maximise profits. Fortunately others have studied them, and their results are illuminating. Large companies are networks of individuals, and therefore behave similarly to other networks, such as computers, brains or ant colonies. Like these other networks, a large company has a much higher processing power than any of the individuals within it. However, large networks are prone to complexity catastrophes, i.e. they break down if exposed to external changes. The way they can get round this is through strong hierarchy and culture - large corporations have to be fairly rigid and non-adaptable otherwise they would collapse into chaos. This is borne out in practice – with surprisingly few exceptions top-performing companies tend to be replaced over time by other companies rather than adapt to changing economic environments themselves. Power companies are usually very large organisations - they might be excellent at producing power, but are unlikely to adapt quickly to other challenges, such as reducing GHG emissions or turning into "power management" companies[28].

Complexity economics views the economy as a dynamic evolutionary system. The arbiter of the evolution process is the market, which is the most effective system yet invented for innovation in disequilibrium. Markets are "good" but not for the orthodox reason that they are the best method of allocating resources in a way that optimises the welfare of society under equilibrium conditions. This efficiency explanation is meaningless – it is looking at the economy as if it were a closed box and seeking the best way of dividing the spoils. Instead markets reward the most effective business plans in a constantly changing economic environment.

For illustration, I will briefly describe a model by Doyne Farmer of the Sante Fe Institute. The model is an "agent based model" which he uses to illustrate his theory. For simplification, Farmer hypothesises two kinds of traders, a seasonal trader and a technical trader. There is no movement in the underlying "value" of the commodity in the market. The seasonal traders buy and sell in a predictable pattern – they could represent, for example, farmers or even companies who need to meet emissions targets. The technical traders are purely in it for the money and are allowed to develop a variety of trading startegies; the more succesful a strategy is, the more capital the trader gets and the more they influence the market. The result is shown in Figure 5[29].

[27] Beinhocker (2007)
[28] ibid
[29] Farmer (2001)

Figure 5 Farmer Model of Markets[30]



What happens is that the market becomes "efficient" after about 5,000 iterations when the technical traders make money off the seasonal traders and "iron" out the predictable seasonal fluctuations. But after that, as you see, the model suddenly goes mad. This is because the technical traders, who have now acquired practically all the capital (as shown in graph B), start trading against each other, devising ever more sophisticated trading strategies which work for a while until another trader develops a better strategy[31].

Now, this model is obviously an over-simplification, but I think it gives us an insight into how markets actually work; unlike the efficient market hypothesis, it does not rely on an un-realistic assumption of perfect rationality amongst uniform agents. The results in a highly volatile world where there are lots of technical traders – i.e. something that resembles the real world. The volatility is not due to external events perturbing the equilibrium, but is endongenous to the market itself. The concept of efficiency - where prices match value - practically never occurrs. Much of the capital is transferred from the seasonal traders – the agents with a real use for the market - to

[30] ibid
[31] ibid

speculative technical traders – is this what we really want to happen in the carbon market?

Suggested policy solutions

Beyond the theoretical limitations of carbon trading, it is unlikely that a system can ever be complete as at the individual level transaction and compliance costs are likely to be immense, and there are always going to be large leakages in an inherently unpoliceable international system.

So what does this mean for the carbon markets and our attempts at greenhouse gas abatement? Well it is very likely that the price of carbon will be highly volatile – meaning that agents are likely to underinvest due to the uncertainty and volatility. The “socially optimum” level target will not be acheived – the target set will be too low, and carbon trading systems will limit overall reductions to this level. And there will be severe leakages which will further undermine the goal. We are seeing all of these happening in practice.

As the economy is non-linear and dynamic, it is impossible to predict what the most effective method will be, a variety of policy approaches will need to be employed, and these will have to constantly improved through deductive tinkering as the economic landscape changes.

One of these methods should be emissions trading. Although the rationale behind trading, that it give rises to reductions in efficiently in a closed equilibrium system, is unrelated to reality, markets are an effective form of economic evolution, therefore having a market in GHG emissions is effective. However, we have seen that in practice there are problems, the systems devised are complex and companies have successfully lobbied for lax targets. There is a need for other measures as well, which might be simpler and more effective.

One of these measures is direct legislation. Traditional economists object to legislation because it means that businesses do not allocate their resources efficiently. A complexity economics view is that though legislation changes the economic environment in which companies operate, the economy can still effectively evolve without any loss of so called efficiency or competitiveness. Examples of such legislation could be banning of new coal power stations (until capture and storage technology becomes available), setting statutory minima on GHG emissions per unit of power and on fuel efficiency of vehicles. Such legislation will probably harm individual companies, but not the economy as a whole as new companies will evolve to take their place – capitalism is the process of creative destruction.

It is true that there is a danger of business being weighed down by too much legislation, however, much of the legislation is either redundant as it was developed on faulty economic theory, or is far less important than climate change mitigation measures. It is this legislation that should be removed not GHG limiting measures.

Complexity economics views the role of government as shaping the landscape in which the economy functions. Legislation is part of this but there are other initiatives that governments could pursue. Obviously governments can provide incentives for new low carbon business plans to evolve. To date much of this has involved revolved around physical technologies of low carbon technology. However, social technologies are equally important, for example encouraging home working or running behavioural changing advertising campaigns.

3 Role for insurance[32]

This section looks at the role for insurance in the carbon markets. Obviously there will be a role for traditional insurance products – such as property insurance of renewable energy projects. However, ther will also be a role for specialised niche products. In particular I will concentrate on the CDM market.

Unsuprisingly, the uncertainty inherent in CDMs is reflected in the price – The discounts being applied to the forward purchase of CERs/ERUs, are significant – up to as much as 70%[33].

Non-delivery insurance
These discounts, which exist because of the risk of non-delivery, mean that the carbon revenue steam is not significantly contributing to project financing - directly in contradiction of many arguments for additionality. If a significant proportion of these risks could be removed or transferred at a reasonable premium, then the carbon revenue can be monetised up front and be taken into the financing decision. This would reduce the project's cost of capital and improve its internal rate of return.

How would such an insurance product work? Firstly it is important to get a clear meaning of 'risk' and in particular 'insurable risk' since not all risks are insurable. The risks associated with non-delivery can be categorised as follows, the majority of which are insurable:

1. Contract Risk
2. Credit Risk
3. Market Risk
4. Operational Risk
5. Performance Risk
6. Physical Risk
7. Political Risk
8. Project Risk
9. Regulatory Risk

This implies a strong business case for insurance, supplying insurance for non-delivery of carbon could reduce the gap between current and forward price, thus enabling investors to hedge future cash-flows, making investment in CDMs more attractive. This is providing the insurable risks associated with non-delivery can be acurately priced.

The largest risk in relation to CDMs are lack of financial closure, other important risks are credit risk political risks (such as confiscation, etc), and specifically carbon risks such as letter of approval from host country not issued, or registration risk. As to

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[32] This section draws on research carried out by Parhelion Underwriting Limited
[33] www.pointcarbon.com

the main risk, lack of financial closure – some projects are just a bad idea. There is a huge amount of compliance to go through before a project is registered, and it is not the insurers job to ensure how good a project is and how well it has been put together –this is the due-dilligence of the project developer and financier. Insurers can add value by insuring against bad luck events and assessing the probability that they will occurr.

For a risk to be insureable, it must be fortuitus, independent, the insured must have an insureable interest, the loss must be measureable in financial terms, it must not be against the law of the land, the risk must be particular to the individual, premiums must be affordable, and the portfolio must be homogenous.

Because insurance works by spreading the losses of the few across the many the cost of insurance is less than the cost of retaining such risks. Most portfolio project developers seek to realise this benefit of diversification by selecting projects in different countries and utilising different technologies. However the benefits of diversification are unlikely to be maximised unless the portfolio is of significant size.

The risk that is unique to CDMs are carbon regulatory risks. The perils fall into 2 categories – the project activity risk is the responsibility of the insured and cannot therefore be insured without introducing a moral hazard. However, the Kyoto activity risk is that the CDM Executive Board[34] or host government changes their mind – this is insurable as it is out of the control of the insured.

The other large peril in CDM host countries is political risk, but these are all familiar insurance risks. The risk profile is actually lower than for, for example traditional energy insurance. The reason is that if a government takes action against a CDM, it will lose all future revenue from other CDM, as this is a compliance driven market.

One potential insurance solution would be a carbon credit delivery wrap – where payment is made in units of carbon where non-delivery is caused by a named insurable event. The delivery wrap adds value as it increases the forward value of the carbon units, having the positive externality of encouraging investment into this vital area.

Another possible specialised product would be a carbon cat bond. The idea here is that Kyoto ends in 2012. The successor to Kyoto has not been agreed upon – the due date is 2009 but there is a great deal of uncertainty over the form of the successor, or even whether there will be one at all. The current EU proposal is to cut back on CDMs, although this is probably a negotiating ploy. So, any financier is looking at a potential end to their stream of income in 2012 due to a potentially disastrous break-down in negotiations – which is a major disincentive to investment. There is therefore a need for a product which pays out on the non-renewal of Kyoto – for example a cat bond.

[34] The organisation, based in Bonn and part of the UNFCCC, that oversees the CDM process

Conclusion

The paper gives a brief overview of the carbon market. The carbon markets look like they are here to stay, are growing – even though they are theoretically flawed, and are likely to under-achieve in managing the risk of dangerous anthropogenic climate change.

There is the potential for both traditional and specialised well-designed niche insurance products in the carbon market. They can give a good spread of risk and are diversified from other insurance risks. Even though there is a strong business case for entering this market - insurers can have the added benefit of feeling they are doing their little bit for the good of the planet!

Acknowledgement
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