Version for website

Caps and Floors for the EU ETS: a practical carbon price

Dieter Helm
Professor of Energy Policy
New College, Oxford[1]

October 13th 2008

1. Introduction

Central to any efficient climate change policy, and to the EU's approach, is the establishment of a credible, long-term carbon price. The EU has chosen to achieve this via the indirect route of the EU Emissions Trading Scheme (EU ETS), rather than by setting the price directly through a carbon tax. It proposes to extend the scheme to 2020, and to deepen its coverage (CEC 2008a, b).

There are a number of reasons why the timing is fortunate: European consumers have begun to get used to high energy prices, just when the oil price has begun to fall back, creating headroom for the carbon price; events in Georgia have emphasised the need for the European economy to move away from dependence on imported fossil fuels, especially gas; and the US presidential election heralds a possible sea change in the US's willingness to engage on climate change.

A key difference between a carbon tax and the EU ETS is that, with a carbon tax, a carbon price can be established over time without much volatility: energy producers and consumers can have some reassurance that the carbon price will not drop below the carbon tax level, and those most affected by the transition to a low-carbon economy can plan, without the exposure to shocks in carbon prices. Carbon taxes have the additional advantage that they can be tailored towards the social cost of carbon, thereby avoiding inefficiency at prices below or above the carbon price. It is for this reason that much academic discussion favours carbon taxes.

[1] Comments to dieter@dhelm.co.uk. Further papers available on www.dieterhelm.co.uk.

The path the EU has chosen therefore raises the prospect of some inefficiency caused by both the level of the EU ETS carbon price being too high or too low, and the volatility. Fortunately, there is an obvious way, and one well researched in the academic and policy literature, to mitigate these weaknesses in the EU ETS; namely, to introduce floors and ceilings.

Such an approach has political and pragmatic advantages, as well as economic ones. It limits the possibility that there will be a backlash by politicians and voters to carbon price spikes and volatility, particularly in periods of high energy prices, and where other policies (such as the ambitious renewables targets for 2020) push up prices and put more people into fuel poverty. Put simply, the problem with the unconstrained EU ETS is that it may fail the credibility test and may lead to a hostile reaction, and should the scheme collapse politically after 2020, it would be disastrous for the wider EU climate change policy.

This short paper considers the case for a cap and floor, both in theory and in practice, and addresses some of the issues that would arise were this mechanism to be incorporated within the EU ETS.

2. Designing the EU ETS to deliver a sustainable carbon price

The objectives of the EU ETS are multiple, but at the core is *the creation of an EU carbon price* which can signal to both the demand and supply sides of the market the costs of carbon, internalising the damage done by carbon emissions. It has the further aim of providing the basis for the emergence of an international carbon price, by facilitating others to join the scheme in due course, and hence becoming a global mechanism to generate a carbon price.

It is important to recognise that it is not the only—or, indeed, necessarily the best—way of achieving this. The main alternative is a carbon tax, and there are good theoretical reasons for thinking that this might be a better route in terms of economic efficiency, depending on the assumptions made about the nature of the costs of mitigating carbon emissions over time, and the nature and timing of the damages. Though the relative merits are open to debate, it is important to realise that the adoption of the EU ETS has more to do with politics than economics, and in particular at the outset the desire by carbon-reducing industries to mitigate the income effects, through a widespread

adoption of grandfathering. Under carbon taxes, revenues flow to governments; under grandfathered permits, they are retained by the industries, and may arguably even create windfalls. The fact that in the future the permits may be auctioned was less important at the time the scheme was being devised.

Recognising that the politics matters, and that the EU ETS is here to stay, does not magic away the drawbacks relative to a carbon tax, and *it is better to recognise these drawbacks of a quantity-based system and try to offset some of the less desirable consequences than to simply ignore them.* As we shall see, these weaknesses are potentially large, and may bring down the scheme as a whole—especially as and when the grandfathering is replaced by full auctioning. In such circumstances, consumers and producers might both revolt against the consequences.

It is hard to overstate the importance of establishing a carbon price. This market-based approach to de-carbonising the European economy has both the general merit of using market-based instruments over regulation and technology-based interventions, and the particular merit of providing a signal to consumers to use energy efficiently and to producers to economise on carbon generation in the short term and migrate to low-carbon technologies over time. *What matters here is that the carbon price is sustainable and credible over the time horizon of the investment decisions of both consumers and producers*—signalling not just how to change immediate behaviour, but how to build low carbon into the fabric of houses, buildings, transport systems, and industry, as well as energy production and distribution.

The challenge to the EU ETS is therefore to provide a predictable, medium- to long-term carbon price which can be factored into the decisions on both the demand and the supply sides of the market. *The unconstrained EU ETS, as currently envisaged, may fail to provide this sustainable and credible price.*

3. The unconstrained EU ETS—its potential problems

The unconstrained EU ETS has the merit of giving (some) certainty over the quantity of emissions, but at the cost of uncertainty about the price level and its volatility. It is important to recognise up front the consequences.

(i) Uncertainty over new permits

First, the certainty over quantity depends upon the number of permits being clearly defined at the outset, and not being changed *ex post*. Yet there can be no such certainty over the period even to 2020. If the price becomes politically sensitive, politicians could respond by increasing the quantity. They may well have this opportunity, since it is extremely unlikely that all the quantity issues will be suddenly resolved by 2012 and then not touched again until 2020. On the contrary, the status of Clean Development Mechanism (CDM) projects is far from clear, both in what exactly they measure, and in their role in respect of developing countries. It is relatively easy to imagine more countries being brought into global emissions trading over the period 2012–20 (indeed, it is essential that they are), and initial generous permit allocations being granted as inducements (indeed, the ratification process for the Kyoto Protocol involved just such considerations—notably in respect of Russia and its 'hot air'). Thus, the best assumption to make is that the quantity will indeed vary (perhaps significantly) over the period 2012–20. Therefore, since the quantity is likely to change, the carbon price will be harder to predict.

(ii) Uncertainty over the price level

Second, the price level under the EU ETS is uncertain—a direct corollary of using permits rather than taxes. It is inherent in any permit system that the price level is not known *ex ante*. The argument for such market-based policy instruments is that policy-makers do not know the supply and demand conditions of the future; if they did, they could simply plan. So if the Commission were to *know* what the price level is likely to be for the period 2012–20, it is either wrong or there is no case for the EU ETS system. What matters here is just how far from the social cost of carbon the EU ETS could be. Evidence from the first period—the 'learning' period—indicates that the price level could be very hard to predict and be significantly above or below the social cost of carbon. The first period saw prices rise substantially above the initial expectations, and then collapse to almost zero. The counter is that this was to be expected: it was, after all, a trial period, and the lessons for the design of the scheme have been learnt. But whilst there is merit in this argument, the initial period was also very simple, for a short period, and covering only a very limited number of firms. Going forward the complexity increases over time.

It may be argued that the futures market in carbon permits will establish a forward price that can be used for investment decision-making. However, a glance at the much deeper oil market quickly dispels this: oil price levels fluctuate at wide ranges, and the level one year ahead can (and is) often more than one standard deviation from the current price (which is typically the best, and very weak, forecast—see Hamilton 2008).

(iii) Volatility

Third, a distinctive feature of the EU ETS is volatility. In an unconstrained EU ETS, this is inevitable and unavoidable, and because futures markets are (and will remain) primarily short-term, this is an additional cost above and beyond that of the carbon tax. That volatility is likely to be especially high, and costly, at the discrete time intervals for future auctions of permits, when companies have to gear up their balance sheets to purchase permits.

4. The advantages of a floor price

A floor price provides a basis for the minimum carbon benefit from low-carbon technologies, and for consumers to feed into their energy consumption and energy efficiency decisions. For the large-scale and longer-term low-carbon technologies, such as nuclear and carbon capture and storage (CCS) (but also wind), it has the advantage of being likely to be sustained over the period beyond 2020. It is therefore likely to influence project finance and feed through into a lower cost of capital (because it is ultimately a political and regulatory risk, rather than a market one).

Put this way, it is hard to think why one would not have a floor: what could the downside risk possibly be? For, if policy-makers genuinely thought that the carbon price might fall below the floor, there would be a credibility question about the scheme as a whole. Either the Commission believes that the EU ETS price will always be above the floor (in which case, there is no problem putting a floor in place), or it believes that the price could fall below (in which case, there is a good case for having a floor).

It remains to set the level of the floor, to which we return below. But the point here is that the further the floor is below the estimated social cost of carbon, the less likely it is to bind, and hence the weaker the objections to it being put in place. If it increases investor confidence, then it is a ‘free lunch’ at a low set level.

5. The advantages of a ceiling price

At the other end of the spectrum of possible carbon prices, there is a more than proportionate increase in costs as the carbon price rises. This is because the capital stock takes time to be de-carbonised. Houses, factories, power stations and transport systems are long-lived and capital-intensive. Thus, as the carbon price rises, the implied capital substitution becomes more inelastic, and hence the main effect on economic activity is via the income rather than the substitution effect. Put simply, as the carbon price rises, companies cut production and close down, or migrate away from the EU ETS overseas.

The Kyoto framework, within which the EU ETS is embedded, encourages just such responses. Kyoto is set in terms of domestic *production* of carbon, excluding aviation and shipping. Though there may be some limited inclusions of these latter two industries after 2012, the important point here is that the Kyoto targets can be met by lowering production as well as by low-carbon production. Thus, a country could de-industrialise, with production shifting to China and other developing countries outside the EU ETS domain. This indeed is what has happened (see Helm, Smale and Phillips 2007). Looking forward, the chances of China adopting tight—and credible—binding targets at the Copenhagen Summit in December 2009 are remote, and the main role it is likely to play is as a source of CDM projects. If the latter happens, the quantity expands and the price of permits falls, making the ceiling non-binding.

Various ways have been suggested to limit the carbon competitiveness effects—notably by some form of carbon import tariff. This is fraught with difficulty, however, not least because of the limited ability of the EU to impose this on the rest of the world (even with US support). The recent lack of an EU coordinated response to the Georgia invasion demonstrates how little political will there is for an EU-wide agreed tariff policy against specific counties. WTO negotiations have reinforced this perception, and it is inevitable that carbon tariffs would be negotiated alongside agricultural and other politically sensitive measures (which have so far defeated attempts to complete the Doha round).

The advantages of a ceiling in the EU ETS would be to tailor the transition towards a low-carbon economy in a way that does not simply result in relocation effects, and thereby negate the impact on the global warming problem.

A further and distinct advantage of a carbon price ceiling is that *it would provide a safety valve in the event of a serious security of supply crisis in the EU*. The external threat to EU energy supplies is well known, as is the internal lack of preparedness and the exposure to shocks (see Helm 2007). The EU has significant capacity gaps in electricity generation in the next decade (during the 2012–20 EU ETS period); there is a lack of strategic gas storage; and the European grids are only weakly developed. In addition, a considerable number of nuclear power stations will be closed before new nuclear comes on stream after 2020. Finally—and crucially—the dash-for-wind implied by the 20% 2020 renewables target (CEC 2008b) will induce a further dash-for-gas as back-up and baseload capacity, just at the precise moment the dependency on Russian gas is increasing strongly (and other sources, like Libya and Algeria, are recognising the advantages of cooperating with Gazprom and Russia).

It is therefore not hard to envisage an 'energy crisis' during the next EU ETS period, but it is hard to envisage that the EU politicians would stand by and simply let the carbon price shoot up as coal was brought back onto the system, before CCS becomes a viable and widespread option. In these circumstances, some form of price abatement for carbon would be inevitable (as with petrol price duties across Europe in the last year in response to the oil price shock). A carbon price ceiling provides a mechanism for achieving this, without the possibility of driving the price too low if a floor is also in place.

6. Counterarguments

A number of objections have been raised to the floors and ceilings approach.

(i) Fungibility

The most serious is the question of fungibility with other countries as the scheme is internationalised. Floors and ceilings would require an additional layer of complexity which would need to be negotiated. However, we have noted that the 2012–20 quantity is not actually fixed, since the CDM projects will be part of the negotiations, and in practice the problem will be that, in order to induce others to join, many will need some assurance that the price will not be high during *their* first period (2012–20). One way of doing this will be to issue lots of new permits. Thus if the prime concern is to add new countries into the scheme, the most important issue will be a floor. The ceiling may not

be binding. Furthermore, it depends what mechanisms are used to establish the floors and ceiling as to whether they have fungibility consequences.

(ii) Flexibility built into the EU ETS

The Commission has argued that the EU ETS already has flexibility built in, thereby recognising the need for floors and ceilings. Thus, however, is not relevant to the points raised above: a floor and ceiling add certainty to the EU ETS; the flexibility mechanisms add uncertainty, since it is unclear how banking between periods, adding in other sectors, and the use of CDMs will affect price. This, whilst flexibility is arguably a desirable feature, it does not address the same issues and problems as price stability and credibility. Indeed, in this respect, it may make matters worse.

(iii) Problems with linking oil and carbon prices

Practical objections have been raised to linking oil and carbon prices. These, however, can be overstated, and it remains true that the two are linked, and therefore to simply ignore oil prices in setting carbon prices is guaranteed to introduce (perhaps serious) inefficiencies. Furthermore, there is no doubt that the wider public and the media are linking the two. In the context of higher oil prices, the resistance to high carbon prices is not surprisingly higher.

(iv) Other measures will have a bigger burden to carry with floors and ceilings

Should the EU ETS breach a floor constraint, the opposite will be true. In respect of the ceiling, the impact depends upon the time duration of the price spike, as well as the inelasticity of capital substitution at the peak of the carbon price. But the main objection is that the 20% renewables and 20% energy efficiency targets are so demanding that if met by 2020, the carbon reductions required by the EU ETS would be (much) lower than currently envisaged by the proposals for the EU ETS 2012–20. In practice, neither of the two 20% targets is likely to be achieved in any event.

7. Practicalities—how to set the floors and ceilings

The levels for the floors and ceilings depend upon: the relative uncertainties about costs and damages; the importance policy-makers attach to the credible signals to future post-2020 investors; and the competitiveness arguments in the transition.

(i) Using estimates of the social cost of carbon as a benchmark

The starting point is the *social cost of carbon*. There have been a number of estimates, including Stern (2007) and Nordhaus (2008). The range indicates that the actual social cost estimation is very sensitive to particular assumptions. There can be no precise answer—indeed, as Nordhaus (2008) indicates, his own estimate has risen sharply. So we do not know the 'correct' social cost, and this is independent of whether a permit or carbon tax route is utilised.

The appropriate reaction to the uncertainty is to start with a relatively tight floor and ceiling, and allow the range to expand over time. Indeed, if and when the permits scheme develops successfully, and if confidence is built up through effective futures markets, the ceiling can be raised.

(ii) Indexing to the oil price

A variant on a simple floor and ceiling is to index them inversely to the oil price. Thus, as oil prices have risen to the peak of $140 a barrel, the implied carbon price has increased very sharply—much more than would have been the effect implied by the design of the EU ETS (even as late as January 2008—CEC, 2008a) or carbon taxes that have been proposed in recent years. Though there are important coal-for-oil-and-gas substitutions, *it is a weakness of the EU ETS that it is invariant to underlying fossil-fuel prices*. An obvious mechanism, with considerable benefits in terms of public acceptability and fuel poverty, is inverse indexation.

(iii) Operationalising floors and ceilings

The next issue is how to practically build in the floors and ceilings. The floor can be relatively straightforward; it could be a carbon tax in addition to the EU ETS. Alternatively, governments (or the EU) could intervene to buy back permits to increase the price (oil plus carbon)—a mechanism analogous to the operations of central banks

in open market operations. The ceiling could take a number of forms too. If a carbon tax is used to establish the floor independent of the EU ETS, and if the EU ETS price rises above the ceiling, there could be rebates of the carbon tax, and, indeed, other taxes on energy-intensive activities too. Alternatively, there could be a buy-out price analogous to that used in the UK Renewables Obligation mechanism and the Renewables Obligation Certificates (ROCs). Finally, more permits could be issued—or more CDM projects allowed in from developing countries—with the EU acting analogous to central banks as above. (The bringing in of more CDM projects would reflect the fact that there are many more projects at lower cost for carbon reductions outside the EU ETS as the price rises to the ceiling.)

Thus there are a number of ways of achieving the floors and ceilings, all of which are utilised in related markets. These mechanisms can be carried out by domestic governments—especially the carbon floor through a carbon tax—and others could be coordinated internationally. Such issues will arise in any event as the EU ETS is broadened internationally.

8. Conclusions

The EU ETS inevitably has flaws, but it is established and provides a key mechanism for the international community to tackle global warming. However, its success in the period 2012–20 is far from guaranteed, and during this period, if and when other countries join, a host of issues will need to be negotiated and adjustments are inevitable.

The EU ETS must also carry European citizens and national governments with it, and if it is to achieve the core objective of providing a sustainable and credible long-term price of carbon, it is important that two risks are dealt with up front: that the price might collapse with more and more countries joining; and that it might go very high, notably in the event of an energy crisis. Futures markets, though they have a useful part to play, will not overcome these problems. The European Commission would be both naive and complacent in simply assuming neither will happen.

The EU ETS would be altogether more robust and credible if it were to be provided with a floor and a ceiling—the floor to signal a baseline for low-carbon technologies in the longer term; and a ceiling to tackle competitiveness and public acceptability; and

both to ensure that the price does not deviate too radically from the social cost of carbon, and hence cause major inefficiency to the European economy.

There are a number of ways of establishing floors and ceilings. The floor can be achieved by a carbon tax, or by official carbon market operations. The ceiling can be achieved through a buy-out price or again by official carbon market operations. Credibility, efficiency and public acceptability would be greatly enhanced if these floors and ceilings were set inversely to the oil price—and this would have the added advantage of building in the current energy price levels as a result of the oil price shock. As consumers have got used to and adapted to high energy costs, now is not the time to allow them to fall away.

Failure to introduce floors and ceilings now is in practice much riskier than going ahead unconstrained. If the EU ETS works as envisaged, the price will be between the floor and the ceiling—and hence such constraints are very low-cost mechanisms. But if the carbon price in the EU ETS is high (or low) and volatile, an *ex post* introduction of measures to stabilise the price will damage the scheme's credibility.

It is therefore recommended that the EU urgently considers the introduction of floors and ceilings to the EU ETS.

9. References

CEC (2008a), 'Proposal for a directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community', COM(2008) 16 final, January 23rd.

CEC (2008b), 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: 20 20 by 2020, Europe's climate change opportunity', COM(2008) 30 final, January 23rd.

Hamilton, J. (2008), 'Understanding Crude Oil Prices', Department of Economics, University of California, San Diego, latest revision June 4th.

Helm, D.R. (2007), 'European Energy Policy: Securing supplies and meeting the challenge of climate change', chapter 16 in D. Helm (ed) (2007) *The New Energy Paradigm*, Oxford University Press.

Helm, D.R., Smale, R. and Phillips, J. (2007), 'Too Good to be True? The UK's Climate Change Record', available at: http://www.dieterhelm.co.uk/December.

Nordhaus, W.D. (2008), *A Question of Balance: weighing the options on global warming policies*, Yale University Press.

Stern, N. (2007), 'The Economics of Climate Change: The Stern Review', Cabinet Office, HM Treasury.