White Paper: Quantifying hope in the forward curve: an options-based approach

Much has been said by various carbon analysts – most notably by Deutsche Bank, about how EUAs have essentially become an option on political intervention in the EU ETS. The logic behind this statement is not hard to see. Supply of EUAs to the ETS in Phase III, when combined with current oversupply and CER supply, present and future, will almost certainly dwarf emissions for the entire phase. Oversupply is no longer an unknown to the market, the question has become, 'How big an oversupply with there be.'

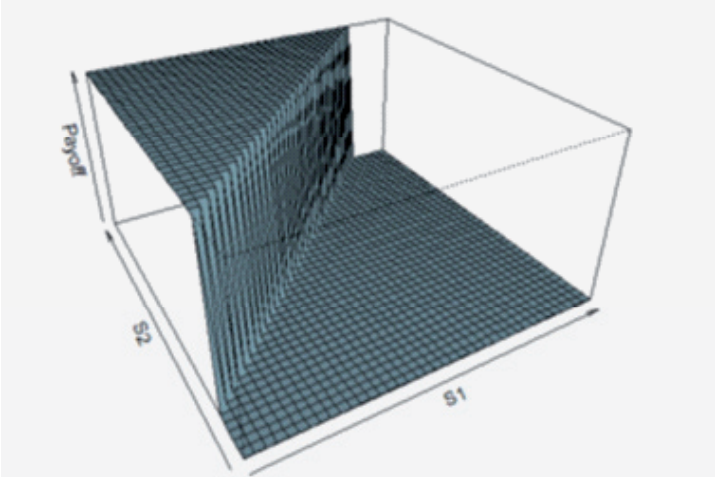
Models to generate EUA prices have typically been based upon Marginal Abatement Cost Curves (i.e. abatement supply curves) matched against demand for abatement. However, in the event of oversupply this standard economic approach to generating the market equilibrium price using supply and demand curves doesn't work because demand for abatement drops to zero. There is an important question when modelling the latter part of Phase III about how far forward looking demand is for carbon, because you may need to take Phase IIII supply, which is a big unknown, into account. The fact is that for 2013, for example, without a permanent change to the 2020 emission target the MACC curve approach can only give you a price of zero for EUAs (because the demand curve is a vertical line at zero on the x-axis), unless you believe buyers are looking about ten years ahead, which is extremely unlikely with economic conditions as volatile as they are.

So if you believe that the current EUA price is in fact an option on political intervention, the right question to be asking is, 'how much intervention is priced in already?' We can determine this, but first we should explain how the model works.

A digital spread option struck on oversupply

A digital spread option pays out a fixed sum if the spread between two underlying assets exceeds a fixed value at the time of expiry. If we choose one of our underlying assets to be EUA supply and the other to be EUA demand and set the spread to be zero then we can calibrate the model to pay out the cost of abatement if demand in a given year exceeds supply in that year. Since MACC curves are essentially useless in the case of oversupply we choose one abatement option, the cost of switching from coal to gas, as the pay out for our EUA option model. Based on current forward curves for coal and gas our fuel switch price is currently around €37/t but falls to around €20/t by 2015 due to higher coal prices, stable gas prices and a weaker EURUSD.

Figure 1. Payoff structure of a digital spread option



Source: Sitmo

We model demand in a given year as the expected emissions in that year. We do not make demand forward looking, as you might expect since utilities hedge up to three years ahead, because it is the futures curve we are seeking to model, which is already a forward looking measure.

Supply in each year is not forward looking so it is modelled as cumulative oversupply up to that year, with the addition of EUA supply in the year and the full CER allowance (since all our forecasts assume efficient CER use). This has the effect of producing a lagged correlation between demand and supply in the EU ETS, since lower demand this year is an upwards driver on cumulative oversupply and therefore supply for next year.

In defining the option we must determine expectation and volatility for our underlying assets. Our forecasts for emissions and the cap enable us to derive expected value for both supply and demand. Looking at historical volatility of emissions data and expected volatility

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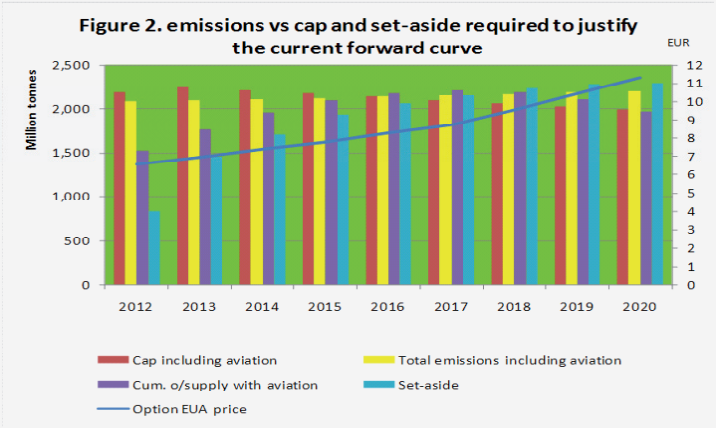
of GDP in the future we ascribe volatility of 8% to both supply and demand, since they are related to one another.

Finally, apply a discount rate to the forward curve, as you would expect. Using this model therefore generates the forward price of an EUA based on the probability of abatement being required in the year of delivery and the cost of that abatement.

Our findings: A lot of optimism is already priced in

Using our model we can determine the value of an EUA under the current regulatory framework, if there was no set-aside and no structural reforms. Unsurprisingly it produces a price of near-zero until 2019, at which point the steady reduction in the cap begins to give a very small probability of abatement needed at the beginning of Phase IV, resulting in an EUA price of around 1 euro in 2020 (since Phase IV is a big unknown our base case assumes the annual linear reduction factor for the cap used in Phase III continues).

More interestingly, we now turn to the key question of 'how much intervention is priced in already?' To do this we force the model to produce today's forward curve (Thursday 17 May 2012) by removing supply from the system if necessary. This removal of supply is analogous to set-aside. The results are shown in Figure 2.



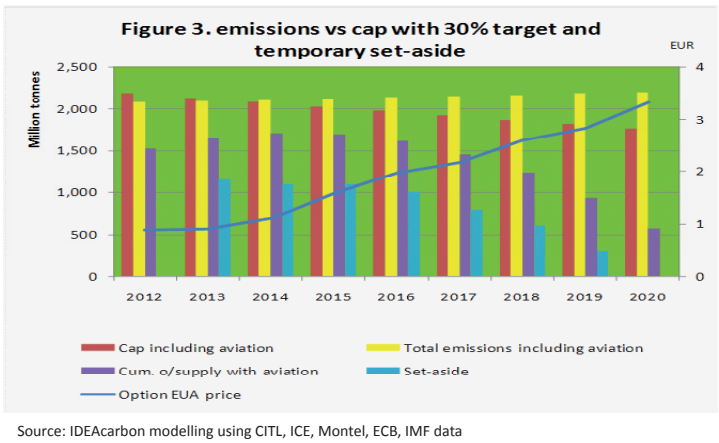
Source: IDEAcarbon modelling using CITL, ICE, Montel, ECB, IMF data

We find that not only does the current EUA forward curve imply a substantial adjust to supply this year (which definitely will not happen) it also implies a very large set-aside of allowances for the entirety of Phase III. Interestingly, our model does allow for supply to be returned to the system. So for instance if only temporary set-aside (interchangeably referred to a 'backloading' of auction supply by politicians) the model could show that. It does not. Instead it shows that the permanent removal of over 2bn tonnes of supply is currently priced into the forward curve. This scenario is clearly un-realistic since a permanent set-aside of that size is not currently on the table.

Modelling a temporary set-aside, combined with a 30% target for 2020

One of the realistic scenarios which might be hoped for is that auction backloading/temporary set-aside (they are the same thing) is agreed upon this year, and later on the EU council manages to agree on a shift to a 30% reduction target in 2020, as opposed to the current 20% target. We model this scenario by increasing the set-aside to 1.15bn in 2013 and lowering it gradually so that all set-aside EUAs are returned to the system by 2020, and by increasing the annual linear reduction factor for the cap in Phase III by the amount required to deliver a 30% cut in 2020.

As can be seen from Figure 3. this scenario yields a non-zero price for EUAs, but still substantially below the current forward curve. The Dec-13 EUA future would be worth around €1, with prices rising gradually towards €3.5 by the end of Phase III.



Source: IDEAcarbon modelling using CITL, ICE, Montel, ECB, IMF data

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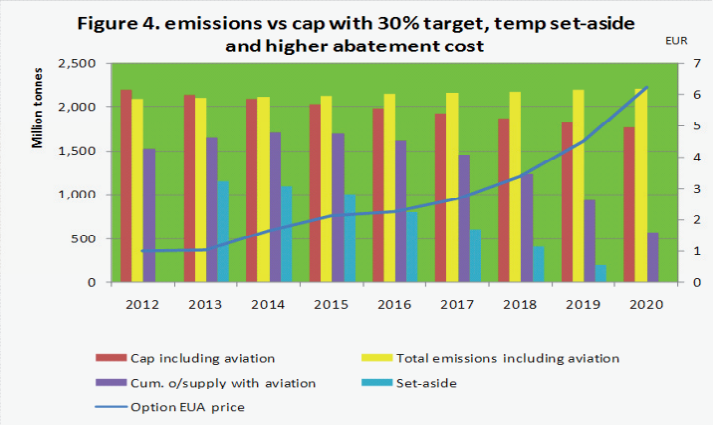
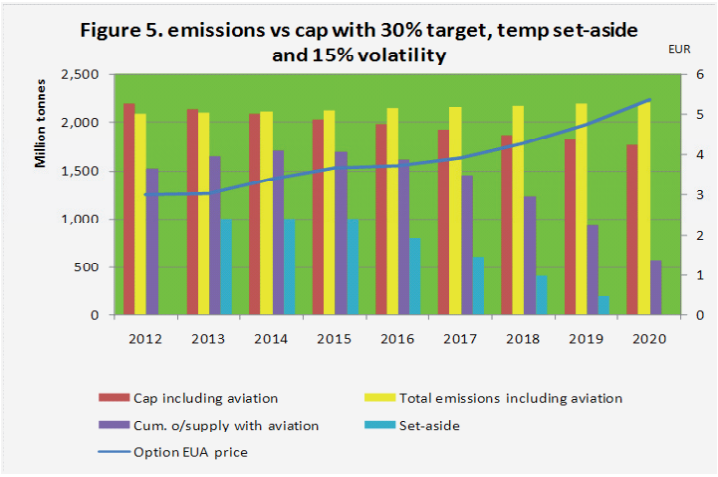
Discussion of the results

When a model returns a result which is quite significantly different from the real world evidence, as this model produces strikingly different prices from the current forward curve, a thorough assessment of its possible flaws is necessary. Firstly, we can test the model's sensitivity to certain factors. Figure 4. shows the model results for the same temporary set-aside and 30% target scenario but assuming that the cost of fuel switch stays around €36, instead of falling to €20. As can be seen, it produces significantly higher prices, but still well below the current forward curve.



Source: IDEAcarbon modelling using CITL, ICE, Montel, ECB, IMF data

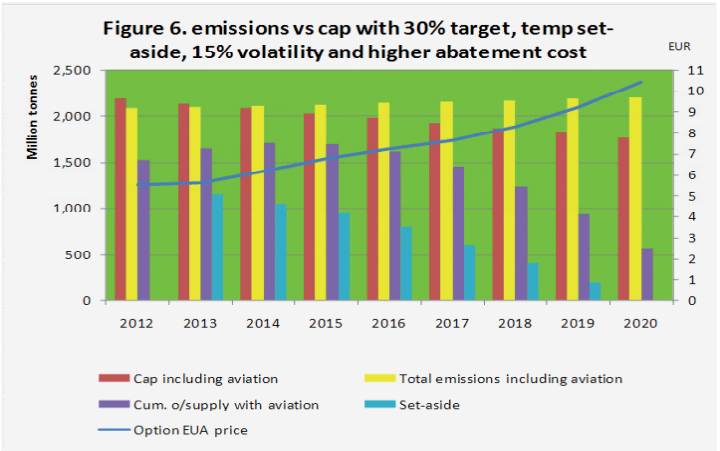
Next we can test the model's sensitivity to volatility of emissions. It is fair to say that the undoing of the EU ETS so far has been the unpredictability of baseline emissions (resulting from the unpredictability of GDP). So what result does the model produce in the 30% target + temporary set-aside scenario if we ascribe a volatility of 15% to emissions? Figure 5. shows the result, again significantly higher than with 8% volatility, but still well below the current forward curve.



Source: IDEAcarbon modelling using CITL, ICE, Montel, ECB, IMF data

Conclusion

If we ascribe a high level of volatility to emissions, assume an optimistic policy scenario and base out calculations on the current cost of abatement, as opposed to the forward cost (we do not actually use a forward price for EURUSD in the fuel switch since we assumed most potential fuel-switchers would not hedge the euro at the moment, since a fall would work in their favour) then we get a forward curve only marginally below current prices (see Figure 6.).



Source: IDEAcarbon modelling using CITL, ICE, Montel, ECB, IMF data

While this set of assumptions is not unjustifiable, it is certainly optimistic. The implication is that a best-case scenario is currently already priced into the forward curve. In reality a 30% target is ambitious, aviation could still drop out of the scheme which would lead to a significant increase in oversupply, and the set-aside volumes may well not be as high as we have assumed. So the answer to the question 'how much intervention is priced in already' has to be: Too much.

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