Futures Market Efficiency in the EU ETS

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based on work by
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Outline

- Motivation
- Carbon Futures Market Development
- Methodology
- Summary of Results
- Conclusions & Possible Future Improvements
Why care about carbon futures market efficiency?

- Futures prices used for:
  - Cost effective risk sharing and transfer (hedging)
  - Informed investment decision making

High carbon price risk in the EU ETS market may be a significant factor in delaying low carbon investments (Neuhoff, 2007).

- Considerable evidence that the forecast error (MSE) of futures prices are lower than alternative price predictors in commodity and other markets.

- Relevance for when to auction or issue permits

EU ETS Price History (Phase 1)

Time (2005 - 2007)

- ECX Dec-06 Futures
- ECX Dec-05 Futures
- ECX Dec-07 Futures
- ECX Dec-08 Futures
- Bluenext Spot
- Nord Pool Dec-08 CER

The potential for sustainable energy futures
Market Development - Phase II 2008

EU ETS Price History (Phase 2)

Time (1/3/ - 22/9/2008)

Price (Euros)

The potential for sustainable energy futures
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Modelling Approach

- Two approaches:
  - Test cost of carry model
    \[ F_{T,t} = S_t e^{(r-\delta)(T-t)} \]
  - Granger causality tests to see whether futures lead price discovery
    \[
    \hat{Y}_{t+1} \left| \{W_t\}_n, \{Z_t\}_n \right. = Y_{t+1} + \epsilon^*_t + 1
    \]

- Looks at just Phase II 2008 trading from March to September.
There is convergence towards the Cost of Carry predictions

Cost of Carry Prediction vs Reality (Dec 2010 Futures)
The Granger Causality Tests also mostly confirm that future prices lead spot prices.

### TABLE 13: TESTS FOR GRANGER CAUSALITY FROM EUA FUTURES TO SPOT PRICES

<table>
<thead>
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<th>REGRESSAND</th>
<th>FULL SAMPLE (N=846)</th>
<th>PARTIAL SAMPLE (N=355)</th>
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<td>Log $\text{Spot Price}_t$</td>
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<td>P-VALUE</td>
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</table>
Conclusions & Possible Improvements

- The cost of carry model has clearly begun to describe carbon futures prices in Phase 2.
  - Contrasting with Milunovich & Joyeux (2006)’s findings on Phase 1
  - Aiming to replicate analysis with OTC data for Phase I
- Combined evidence supports the assertion that EU carbon futures markets are *beginning* to perform a price signalling function.
- Clear effect of short Phase length in the trading volume data (as noted by other authors, e.g. Buchner (2007), IEA (2007))
- A longer time frame and more frequent data on energy prices would definitely improve the analysis.