Science and the stock market: Investors’ recognition of unburnable carbon

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Unburnable Carbon
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Declared reserves

- 2795 GT CO₂

2 °C of warming

- 565 GT CO₂

Man-made CO₂ in atmosphere now

Global CO₂ in 1750
What we study and test

- *When* and *whether* the stock market might have recognized the potential loss of value to energy company shareholders due to unburnable carbon.

- Rational response hypothesis
  - Allen et al. (2009), Meinshausen et al. (2009)
  - Media inattention and investor response to initial news

- Lagged response hypothesis
  - Media attention and limited investor response to later news.

- Does financial statement oil and gas reserve disclosure matter?
Unburnable carbon print stories

Source: Factiva
Accounting reserve disclosure

Unburnable reserves (% of 2P reserves)

Source: Company data, Wood Mackenzie, HSBC calculations
Why is this interesting?

• Carbon bubble proponents
  – Dire consequences
  – *Carbon Tracker* estimates up to $4 trillion financial loss.

• Media bias

• Efficient markets and unbiased assessments of future returns
  – Investor anticipation of all future scenarios
  – Investor discounting of uncertain future benefits

• Costs and benefits of financial disclosure
What do we find?

• Results support the rational response hypothesis
  – 1.5% to 2% decline around April 30, 2009 date for a sample of 63 of the largest U.S. oil and gas companies.
  – No significant response to later media stories in 2012 to 2013
    • Negative stories, but they conveyed little new information
  – Some evidence of a negative response over longer event window for companies with significant oil & gas reserves on their balance sheets.
The regression model (Table 5)

- Daily stock return $R_j$ is regressed on
- RF, Mkt-RF, SMB, HML (Fama-French factors)
- PercentageChangeOilPrice
- CarbonTaxDum
- NaturePublicationDum
- ProvedReserveDum
- OtherNewsDays-1to5 (or -1to10)
- Earnings announcements
- Size
- Environmental score
- Interaction effects for ProvedReserveDum
Regression model results (Table 5)

- Daily stock return $R_j$ is regressed on
- $RF$, $Mkt-RF$, $SMB$, $HML$ (Fama-French factors)***
- $\%\text{ChangeOilPrice}$*** positive coeff.
- $\text{CarbonTaxDum}$*** negative coeff.
- $\text{NaturePublicationDum}$** negative coeff.
- $\text{ProvedReserveDum}$ ns
- $\text{OtherNewsDays-1to10}$*** negative coeff.
- $\text{Earnings announcements}$*** positive coeff.
- $\text{Size}$*** negative coeff.
- Environmental score * positive coeff.
- $\text{OtherNewsDays-1to10}*\text{ProvedReserveDum}$*** negative
Aggregate loss of 2.48% of market value

Dollars in thousands
The 2009 *Nature* publication reflects most of the $27.050 billion loss

- $22,042
- $5,008

- Nature publication
- All other unburnable carbon stories
Explanation of findings

• Results support the rational response hypothesis
• Investors consider options, dynamics, and future innovation.
  – CCS, EOR
• Investors anticipate governmental policies.
  – Tax costs and subsidies
• Investors consider time to transition to low carbon economy.
• Investors not swayed by media bias.
• Investors use multiple channels of information.
  – Not just information about reserves from financial statements
Other market-based indicators

Median Price-Earnings Ratio for 29 International Oil and Gas Stocks
Credit spreads logically include climate change risk as a pricing factor. Now less than 150 basis points per $100 of notional value.
More recent events

• 3/1/2014 Norway Government Pension Fund to review fossil fuel investments
• 4/1/14 Exxon-Mobil comments on carbon risk
• 5/6/14 Stanford University to divest from coal
• 6/7/14 New members of the SASB (Economist)
• 6/9/14 Tom Steyer to divest from fossil fuels
  – Farallon Capital to divest from fossil fuel investments
  – Steyer: a member of Stanford University Board of Trustees

• Do divestment campaigns serve investors’ needs?
Caveats and limitations

• Cannot rule out a carbon bubble.
• Results apply to U.S. companies and markets only.
• May have underestimated the impact of news stories.
• Unforeseeable events may change investors’ calculus of unburnable carbon risk.
Questions?