Electricity futures and stock market response to electricity sector material disclosures

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Outline

1. Introduction
2. Literature & Hypotheses
3. Data
4. Methodology
5. Results
6. Conclusions

1. Introduction

- Markets rely on the fair and orderly dissemination of material info
- Trading Insider information leads to higher cost of capital, lower liquidity and creates opportunities to manipulate markets
- Related concerns in electricity markets
  - Manipulation: Californian electricity markets 2000/2001
  - Enhanced market monitoring and disclosure regimes in the US (FERC) and Europe (REMIT & ACER) (Diaz-Rainey et al. 2011; Ledgerwood & Carpenter, 2012; Nijman, 2012).
- NZ: Electricity Industry Participation Code 2010 (**Code**): must disclose information that "the participant expects… will have a material impact on prices in the wholesale market" (EA).
- ***exclusions "information insufficiently definite" and "commercially disadvantage"*** (**spot & hedge market (inc. futures**)
- Concerns misused, frustrating "net public benefits" **EA 2017 review**

NZ Context

- NZ: electricity market (1996); "textbook" reform (Joskow 2006)
  - *locational marginal pricing or nodal pricing*
  - Mandatory pool (all trades must come through the market)
- Market participants
  - 7 listed firms; 4 'gentailors' > 85% generation market share
  - Market power & part government ownership
  - Big 4: 'Mandated' Market Making in futures (ASX traded)
- Therefore, Gentailors have superior information on
  - physical side and in futures market (as MM)
- **Code exclusions** = acting on material non-public information, in certain cases, prior to disclosure ***may*** to be legal in the electricity market (but not the equity market)
- but it may be undermining confidence in the market
- **Jurisdiction code vs. FMA vs. ASX regime? Consistency?**

RQ and Contribution

Research question:

- Are gentailors using **Code** disclosure ***exclusions*** to trade ahead of announcement? {high burden of proof – inference from …}
- Is there evidence of information leakage prior to announcement?
  - Anticipation [might anticipate but timing mitigates this concern]

How

- an event study on stock and futures markets - 66 public announcement that are derived from a unique dataset that categorises events as negative or positive (sector wide impacts)

Contributions

- literature on the financial regulation of energy electricity markets (Diaz-Rainey et al. 2011; Ledgerwood & Carpenter, 2012 etc).
- literature focused mainly on market monitoring
- Limited empirical research on fair disclosures in electricity markets.

2. Literature & Hypotheses

Information disclosure and insider trading

- NZ equity markets: 2002 law reduced cost of capital, spreads and volatility (Gilbert et al. 2007 informational asymmetry (**spreads = adverse selection**) but still suggestions of insider trading around announcements (Jiang et al. 2011)
- NZ electricity markets: market power in wholesale translates to market power in futures market (de Braganca and Dalgish 2012**)**

Hypotheses

  - Reputational capital high NZ; Gentialors visible to public
  - Unlikely to break law (knowingly) but likely to take advantage of exclusions in 'Code' (Gilbert et al. 2007 vs. Jiang et al. 2011)
  - Risk averse (former state firms): loss aversion behaviour
  - Code reinforces this via 'commercial disadvantage' exclusion
  - **Futures: pre event -'ve impact for NEG**

3. Data

- **Period:** 2012 to 2016
- **Energy Link Ltd. Events Dataset**
  - Classified as having negative (NEG) or positive (POS) effect
  - 66 events selected where
    - Gentailors had/likely to have ‘inside information’
    - Had sector-wide implications
    - E.g. Smelter in Bluff (11% of Demand)
- **ASX/Energy Link Ltd. Electricity Futures Data**
  - Futures data – volumes, OI & closing prices
  - Future contracts traded relative to two nodes
    - Benmore & Otahuhu
- **Financial market data (**DataStream**)**
  - NZ Fama-French three factors - Fama and French (1993)
  - excess return (*RMRF)* size (*SMB)* and value (*HML*)

4. Methodology

Models 1: Daily excess return of the equally weighted energy stock portfolio

$$R_{p,t} - RF_t = \alpha + \beta_1 POS + \beta_2 NEG + \beta_3 POS\{-5,-2\} + \beta_4 POS\{-1,+5\} + \beta_5 NEG\{-5,-2\} + \beta_6 NEG\{-1,+5\} + \gamma_1 RMRF_t + \gamma_2 SMB_t + \gamma_3 HML_t + \varepsilon_t$$

Models 2: Models for daily return of the futures for BEN and OTA nodes

$$FR_t = \alpha + \beta_1 POS + \beta_2 NEG + \beta_3 POS\{-5,-2\} + \beta_4 POS\{-1,+5\} + \beta_5 NEG\{-5,-2\} + \beta_6 NEG\{-1,+5\} + \gamma_1 RMRF_t + \gamma_2 SMB_t + \gamma_3 HML_t + \gamma_4 Volume_t + \gamma_5 OpenInterest_t + \varepsilon_t$$

Models 3: Models for change in open interest for BEN and OTA nodes

$$OpenInterest_t = \alpha + \beta_1 POS + \beta_2 NEG + \beta_3 POS\{-5,-2\} + \beta_4 POS\{-1,+5\} + \beta_5 NEG\{-5,-2\} + \beta_6 NEG\{-1,+5\} + \gamma_1 RMRF_t + \gamma_2 SMB_t + \gamma_3 HML_t + \gamma_4 Volume_t + \varepsilon_t$$

Models 4: Models for change in volume for BEN and OTA nodes

$$Volume_t = \alpha + \beta_1 POS + \beta_2 NEG + \beta_3 POS\{-5,-2\} + \beta_4 POS\{-1,+5\} + \beta_5 NEG\{-5,-2\} + \beta_6 NEG\{-1,+5\} + \gamma_1 RMRF_t + \gamma_2 SMB_t + \gamma_3 HML_t + \gamma_4 OpenInterest_t + \varepsilon_t$$

5. Results

Table 1. Models for daily excess return of the equally weighted energy stock portfolio

	M1	M2	M3	M4	M5
Const	0.00	0.00	-0.05	0.00	-0.05
	-0.07	-0.04	-1.63	-0.03	-1.48
Pos_Day	-0.35				
	-0.98				
Neg_Day	0.39				
	1.08				
Pos_[-5,-2]				0.08	0.09
				0.68	0.71
Pos_[-1,+5]		-0.08	-0.13	-0.09	-0.13
		-0.78	-1.35	-0.82	-1.39
Neg_[-5,-2]				-0.12	-0.20
				-0.76	-1.56
Neg_[-1,+5]		0.08	-0.01	0.08	-0.01
		0.75	-0.10	0.75	-0.11
RMRF			1.14		1.14
			11.81		11.80
SMB			0.40		0.40
			4.93		4.92
HML			0.49		0.49
			5.90		5.90
adj. R2	0.00	0.00	0.09	0.00	0.09
obs	1883	1883	1880	1883	1880

Little/inconclusive evidence of information leakage in equity market

Marginally sig in one tail test

BEN2201							
	M1	M2	M3	M4	M5	M6	M7
Const	0.24	0.31	0.31	0.45	0.33	0.33	0.44
	1.19	1.40	1.42	1.06	1.46	1.48	1.05
Pos_Day	-0.64						
	-1.28						
Neg_Day	-1.66						
	-1.08						
Pos_[-5,-2]					0.30	0.34	0.40
					0.30	0.33	0.40
Pos_[-1,+5]		-0.72	-0.77	-0.71	-0.73	-0.78	-0.73
		-1.99	-2.09	-1.92	-1.96	-2.07	-1.93
Neg_[-5,-2]					-1.09	-1.09	-1.02
					-2.38	-2.47	-2.30
Neg_[-1,+5]		-0.77	-0.83	-0.74	-0.77	-0.84	-0.76
		-1.59	-1.71	-1.52	-1.62	-1.74	-1.57
RMRF			-0.01	-0.01		0.00	0.00
			-0.04	-0.04		0.00	0.00
SMB			-0.53	-0.54		-0.53	-0.54
			-1.93	-1.96		-1.93	-1.96
HML			0.03	0.03		0.02	0.02
			0.09	0.08		0.07	0.06
Volume				0.00			0.00
				0.03			0.08
OpenInterest				0.00			0.00
				-0.48			-0.42
adj. R2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
obs	1882	1882	1879	1879	1882	1879	1879

Table 2. Models for daily return of the futures for BEN node (OTA node not reported)

Sig. NEG Price [-5-2] effect (stronger for BEN than OTA)

- Lock in prices, sell futures in anticipation of further drop at t
- Loss aversion or avoidance
- Increased hedging
- Avoided loss up to (M6)
  - **NEG [-5-2] (-1.09 x4)**
  - **NEG [-1+5] (-0.84 x 7)**
  - **= - 4.36 - 5.8 = -10.16%**

POS [-5-2] not sig.

- Long position in physical market
- generating capacity; storage in lakes; benefit from P rise
- Therefore no need to do anything; infarct can hedge less if prices expected to rise

BEN2201							
	M1	M2	M3	M4	M5	M6	M7
Const	0.20	0.18	0.18	-1.06	0.21	0.20	-1.01
	0.86	0.86	0.85	-2.92	1.06	1.04	-2.88
Pos_Day	-3.43						
	-1.31						
Neg_Day	-9.08						
	-1.22						
Pos_[-5,-2]					-2.16	-2.14	-2.05
					-0.90	-0.89	-0.85
Pos_[-1,+5]		-1.75	-1.73	-1.68	-1.60	-1.58	-1.53
		-0.89	-0.88	-0.85	-0.79	-0.78	-0.74
Neg_[-5,-2]					1.78	1.66	0.87
					1.96	1.84	0.97
Neg_[-1,+5]		0.76	0.74	0.12	0.75	0.74	0.12
		0.45	0.44	0.08	0.45	0.44	0.07
RMRF			0.46	0.51		0.43	0.49
			0.89	1.02		0.86	1.01
SMB			-0.11	-0.05		-0.10	-0.04
			-0.23	-0.12		-0.21	-0.09
HML			-0.60	-0.57		-0.59	-0.56
			-1.15	-1.09		-1.15	-1.09
Volume				0.28			0.28
				3.96			3.93
adj. R2	0.00	0.00	0.00	0.04	0.00	0.00	0.04
obs	1882	1882	1879	1879	1882	1879	1879

On day of announcement info asymmetry/uncertainty reduced so less hedging

Table 3. Models for change in open interest for BEN node (OTA node not reported)

NEG events[-5-2]

- Increased hedging
- **= OI increases**
- **Economic significance**

POS events [-5-2]

- Long position in physical market
- no need to do anything;
- **can hedge less (do not roll over hedges)= OI decreases**
- **Economic significance**

BEN2201							
	M1	M2	M3	M4	M5	M6	M7
Const	-0.05	-0.05	-0.03	-0.04	-0.01	0.01	-0.04
	-0.45	-0.45	-0.25	-0.35	-0.06	0.11	-0.39
Pos_Day	2.96						
	1.34						
Neg_Day	2.38						
	1.09						
Pos_[-5,-2]					-0.46	-0.48	-0.52
					-0.62	-0.65	-0.68
Pos_[-1,+5]		0.26	0.27	0.27	0.31	0.33	0.30
		0.48	0.50	0.48	0.57	0.59	0.54
Neg_[-5,-2]					-1.01	-0.92	-0.96
					-0.86	-0.79	-0.82
Neg_[-1,+5]		0.64	0.69	0.69	0.63	0.68	0.64
		0.88	0.93	0.90	0.86	0.92	0.85
RMRF			-0.67	-0.67		-0.66	-0.66
			-1.36	-1.36		-1.34	-1.34
SMB			-0.04	-0.04		-0.04	-0.04
			-0.11	-0.11		-0.09	-0.09
HML			0.09	0.09		0.08	0.08
			0.19	0.19		0.18	0.18
OpenInterest				0.00			0.00
				0.08			0.47
adj. R2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
obs	1882	1882	1879	1879	1882	1879	1879

On day of announcement large volumes as participant reduce hedging (info asymmetry and OI reduces)

Table 4. Models for change in volume for BEN node (OTA node not reported)

POS [-5-2] nothing happening consistent with gentialors doing nothing

NEG [-5-2] Vol. decrease. Other participants sense asymmetry of information (MM spreads widen as P of futures is dropped to lock in prices before time t)

- **Evidence of adverse selection in NZ equity markets**
- **Economic significance** rather than statistical sig.

5. Conclusions

Stock market

- Reputational capital high NZ (Gentialors highly visible to public)
- limited evidence of information leakage in equity market

Futures - Asymmetric effect

- **Sig. NEG Price [-5-2]** effect (stronger for BEN than OTA)
- Lock in prices, sell futures in anticipation of further drop at t
  - Loss aversion or avoidance (Loss of up to 10% avoided)
  - Increased hedging (prob. net short) = higher OI
- **POS [-5-2] not sig.**
  - Long position in physical market
  - generating capacity; storage in lakes; benefit from P rise
  - Lower hedging = lower OI
- **NEG [-5-2] Vol. decrease.** Other participants sense asymmetry of information (MM spreads widen as P of futures is dropped)

Policy Implications

Asymmetry futures price response reveals that Gentailors

- Avoid loss of up to 10%
- This is probably 'legal' (as per 'Code') ***(but ASX or FMA?)***
- But at the expense of other market participants
  - Smaller generators do not get an equivalent chance to lock-in prices prior to drop
- much higher bar for commercial exemptions in the 'Code'
  - EA 2017 review – replaced **'commercial disadvantage'** > **'reasonable person'** exclusion. But includes consideration of
  - "whether disclosure by the participant would unreasonably prejudice that participant's position and activities in the wholesale market or in their commercial operations more generally"
  - **Vs. REMIT – trading only to cover immediate physical loss from unplanned outages**
- Govt. ownership stakes & dividends!