A Mind for the Market: An fMRI Study of Attribution of Mental States to Financial Markets

Antoine Bruguier¹, Steven Quartz², and Peter Bossaerts*²
California Institute of Technology - 1201 E California Blvd, Pasadena, CA 91125
¹antoine@caltech.edu - ²steve@hss.caltech.edu - *pbs@rioja.caltech.edu - *corresponding author
This work was supported by NSF Grant SES-0527491

1. Experimental data collection

Setup:
- 20 subjects divided into two groups (inspectors and non-inspectors)
- inspectors are given a signal (green line)
- signal within $0.10 of the dividend (red line) of stock X
- add stock Z (dividend(X) + dividend(Z) = $0.50) and a bond

Insiders skew trades:
- if insiders have a signal at $0.09
- if stock trades at $0.40
- then they sell stock and price goes down

Control periods:
- periods where there are no insider(s)

Question: How can non-inspectors use inspectors’ behavior to guess signal? We hypothesize that subjects anthropomorphize markets.

2. fMRI experiment

• replay all the recorded trades to 18 subjects (other pool)

Step (i): tale them whether the session has inspectors
• ask them to choose between stock X or Z

Step (ii): replay the market with moving bubbles
• always display X
• numbers indicate prices (cents)
• blue/red circles are offers to buy/sell (bids/asks)
• subjects must press key every time there’s a trade (green circle for 500ms).

Step (v): subjects are informed of the outcome

3. A mind for the market

All the activations reported are the contrasts between insider and non-insider sessions. We therefore remove the influence of the traders and look at the perception of the stock market itself.

4. Looking beyond the trades

Activation to the contrast of block regressors: compares mean activation between sessions

- standard theory (Barner) predicts that subjects need only pay attention to trades (green circles, section 2, step (ii))
- our hypothesis: subjects use bids and asks (red and blue circles) to better understand the market

Lingual gyrus activation:
- when extracting global meaning despite local distractors, activation of lingual gyrus (Fink et al. 96, Fink et al. 97)
- local distractor = green circle
- global meaning = entire screen

Conclusions:
- attention to outstanding offers, not just trades

5. Future work

- potentially create another experiment (coupon market crash)
- reverse correlation / ridge regression
- potentially create another experiment (coupon market crash)

References and notes

M. Bhask, C. Camerer, Games and Economic Behavior 52, 424 (2005)
G. Fink et al., Brain 120, 1779-1792 (1997)
C. D. Frith, H. L. Gallagher, TRENDS in Cognitive Sciences 7, 77 (February 2003)
M. Bhask, C. Camerer, Games and Economic Behavior 52, 424 (2005)
G. Fink et al., Brain 120, 1779-1792 (1997)
C. D. Frith, H. L. Gallagher, TRENDS in Cognitive Sciences 7, 77 (February 2003)

Thanks to Colin Camerer, Flavia Castelli, Charles Plott, and the members of the Social Cognitive Laboratory for providing helpful comments. Thanks to Steve Flaherty for providing technical assistance.

Presented at the HSD PI Meeting in Washington, DC on September 14-15, 2006