The Brain Exposed To Markets
Question

- What do you expect to see if you put participants in a scanner while (re-)playing markets with insiders?
- ... and markets with mis-pricing (bubbles in particular)
- (Focus on CONTRAST between sessions
  - With/without insiders
  - With/without mispricing
- (What would you ask participants to do in scanner?)
Link with theory of mind
Activation in paracingulate cortex? Temporo-parietal junction?
What do the signals mean?
  • What are participants paying attention to?
  • Would finance be able to help here?
    • Bid-ask spread
    • Order arrival?
Even large-scale, anonymous financial markets may be perceived as intentional, goal-oriented – or “strategic:” there may be “insiders”

Questions:
1. Is this within scope of Theory of Mind?
2. Does Theory of Mind help?
3. What does it do?
Markets are re-played in scanner while subject is exposed to risk

Subject:
• Predicts price changes in market replay;
• Performs Theory of Mind tests;
• Performs (financial) mathematics test
Market Replay
Graphical replay of market

(i) choice
There are insiders
Choose X or Z?

(iii) replay

(v) outcome
The stock you picked paid $0.45

(blank)

(ii) blank

(iv) blank

(blank (ITI))

10s 10s 2 min 30s 10s 3s 13s

repeated 13 times
Effect of $|\text{price-0.25}|$, contrast between insider and no-insider treatment

Bruguier, ea, *resubmitted*
Prediction Performance Results

Against Heider test

Against Math test

\[ \rho = 0.348247, \ p = 0.022110, \ n = 43 \]

\[ \rho = 0.060792, \ p = 0.698569, \ n = 43 \]
2. Bubble Markets

B  Non-Bubble Market

C  Bubble Market

- Bids
- Asks
- Fundamental price
Same Idea BUT NOW ALLOW POSITION TAKING!

Period 1
- cash = 5400
- share = 2

...average of 3 choices per period........

Period 2
- cash = 12300
- share = 8

End of period
- Dividend 60
- Cash 12300
- unit 8

Begin new period

... session ends after Period 15
Non-Bubble Market

Bubble Market

1. $3.4 - 2nd-best asking price
2. $3.0 - best asking price
3. $2.8 - best bidding price
4. $2.5 - 2nd-best bidding price
A

B

y = 53

x = 3

Percent Signal Change in vmPFC (3 53 - 2)

Bubble Markets

Non Bubble Markets

A

B

2.8

3.2

3.6

t - value

low

med

hig

low

med

high
A Bubble susceptibility index
Parameter estimates in vmPFC (-6 50 1)

y = 52
x = 6

B Bubble susceptibility index
Parameter estimates in vmPFC (-6 50 1)
ToM Tests

A

B

% signal change in dmPFC

[CPV - Bubble Markets]

ToM (eye score)
What is being tracked in PCC?

- Probability of “informed” (intentional?) trading
- = test of in-homogeneity of Poisson
PID (Poisson Inhomogeneity Detector)