

Econ 219B
Psychology and Economics: Applications
(Lecture 10)

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April 11, 2007

Outline

1. Overoptimism
2. Overconfidence
3. Projection Bias

1 Non-Standard Beliefs

- So far (mostly) technological deviations (r) from standard model:

$$\max \sum_{i=1}^N p_i U(x|s_i, r)$$

- Non-standard preferences
 - Self-Control Problems
 - Reference Dependence
 - Social Preferences
- Non-standard information processing
 - Limited Attention
 - Menu Effects
 - Social pressure and persuasion

- Non-Standard Beliefs:

$$\max \sum_{i=1}^N \tilde{p}_i U(x|s_i)$$

where \tilde{p} is the subjective distribution of states S_i for agent.

- Distribution for agent differs from actual distribution: $\tilde{p} \neq p$.
- Examples:
 - Overestimate self-control (β and $\hat{\beta}$) \rightarrow Naiveté
 - Underestimate response to social pressure (Milgram experiments)
 - Overestimate ability to run company
 - Overestimate precision of point estimate

2 Overoptimism

- Experiment: **Camerer and Lovallo (AER, 1999)**
- Entrepreneurs choose
 - new business with stochastic outcome $\mathbf{x} = (x_1, \dots, x_n)$
 - riskless activity y
- Standard model: Choose business if $\sum_{i=1}^N p_i x_i > y$
- Overoptimism: Choose business if $\sum_{i=1}^N \tilde{p}_i x_i > y$
- The higher the overoptimism, the higher the incidence of business failure

- Experimental design:
 - Initial endowment: \$10
 - Simultaneous entry decision:
 - * enter \rightarrow play game
 - * stay out \rightarrow payoff 0
 - Parameter c for entry payoffs:
 - * Top c entrants share \$50
 - * Bottom $n - c$ entrants get $-\$10$

TABLE 1—RANK-BASED PAYOFFS

Rank	Payoff for successful entrants as a function of ‘c’			
	2	4	6	8
1	33	20	14	11
2	17	15	12	10
3		10	10	8
4		5	7	7
5			5	6
6			2	4
7				3
8				2

- – $n = 12, 14, 16$ subjects
- Within-subject variation in games played if entry:
 - * chance
 - * skill (trivia, puzzles)
- Only feedback: Total number of entrants
- Paid at the end of game for one randomly-determined round (no feedback on performance)

TABLE 3—DESCRIPTION OF EXPERIMENTS

Experiment #	Sample	<i>n</i>	Selection procedure	Rank order
1	Chicago, undergraduates	12	random	R/S
2	Chicago, undergraduates	14	random	S/R
3	Wharton, undergraduates	16	random	R/S
4	Wharton, undergraduates	16	random	S/R
5	Wharton, undergraduates	16	self-selection	R/S
6	Wharton, undergraduates	16	self-selection	S/R
7	Chicago, M.B.A.'s	14	self-selection	R/S
8	Wharton, M.B.A.'s	14	self-selection	S/R

- Optimal decision for risk-neutral players in chance game

- Asymmetric Nash equilibria:

- $c + 4$ enter

- $n - (c + 4)$ stay out

- Probability of being in top group p

- Probability $p = c / (c + 5)$

- average payoff of entry is

$$p \frac{50}{c} - (1 - p) 10 = \frac{1}{c + 5} 50 - \frac{5}{c + 5} 10 = 0$$

- average payoff of exit is 0 \rightarrow Indifference

- In game of skill, similar equilibria
- Enter until zero profits
- Overoptimism about winning probability ($\tilde{p} = p + \Delta > p$) but expect $c+4$ to enter
- Expected profits from entry

$$(p + \Delta) \frac{50}{c} - (1 - (p + \Delta)) 10 = 0 + \Delta \left(10 + \frac{50}{c} \right) > 0$$

- Excess entry \rightarrow Negative profits on average

- Compare profits in games of luck and games of skill
- Table 4:
 - Games of luck: Substantial profits (more than in Nash eq.) → Too little entry!

Profit for random-rank condition														
Experiment #	n	Rounds												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
1	12	50	50	20	30	40	30	20	50	30	40	20	40	420
2	14	0	-10	10	20	-10	10	20	10	0	0	30	20	100
3	16	10	50	20	40	10	20	30	40	20	40	30	20	330
4	16	0	10	10	20	10	-10	0	10	20	10	0	20	100
5	16	20	10	10	10	0	0	30	20	-10	0	0	0	90
6	16	30	20	10	0	-10	30	20	10	10	30	10	20	180
7	14	10	20	40	20	30	40	-30	40	10	0	0	20	200
8	14	20	10	0	30	30	0	10	10	20	10	20	40	200

- – Games of skill:
 - * lower profits (but still >0)
 - * negative profits in cases with recruitment on skill (Experiments 5-8)

Profit for skill-rank condition														
Experiment #	<i>n</i>	Rounds												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
1	12	50	0	20	10	30	10	20	10	40	10	10	30	240
2	14	0	-10	10	20	-10	10	20	10	0	0	30	20	100
3	16	10	20	10	20	0	10	20	10	10	30	20	10	180
4	16	0	0	20	20	10	-30	10	-10	-10	10	-20	0	0
5	16	-30	-20	-20	-10	-40	-10	-30	0	-30	-10	-20	0	-220
6	16	10	-40	-20	-30	-10	-30	-10	-20	-20	-10	0	0	-180
7	14	-40	-10	-10	0	-20	-10	-40	0	0	0	-10	0	-140
8	14	10	-10	-10	-10	-20	-20	-20	0	-20	10	-20	-20	-130

- Comparison between Chance and Skill treatments

TABLE 5—AVERAGE DIFFERENCE IN EXPECTED PROFITS PER ENTRANT BETWEEN RANDOM AND SKILL CONDITIONS

Measure	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5	Experiment 6	Experiment 7	Experiment 8	Total
$\Pi_r - \Pi_s$	1.635 (1.98)	0.477 (1.41)	-1.19 (1.72)	0.24 (2.41)	1.62 (1.32)	2.49 (1.27)	3.16 (1.61)	1.80 (1.20)	1.31 (2.04)
# of S 's with $\Pi_r - \Pi_s < 0$ (percent)	10/12 (83)	10/13 (77)	3/11 (27)	7/14 (50)	12/13 (92)	12/13 (92)	13/13 (100)	11/12 (92)	78/101 (77)
# of S 's with $\Pi_s < 0$ (percent)	0/12 (0)	0/13 (0)	0/12 (0)	2/15 (13)	12/15 (80)	15/16 (94)	12/14 (86)	11/14 (79)	52/111 (47)

- (Relative) overoptimism. About what?
 - Own ability
 - Underestimate entry of others?

- Forecasts of people about entry of others:
 - forecast 0.3 entrants too high in chance game;
 - forecast 0.5 entrants too low in skill game;
 - (some underestimation of entry of others)

- Open questions:
 - Are people overoptimistic in general?
 - Without ex-ante selection, more entry but no excess entry
 - Perhaps on average people are unbiased, but overconfident people sort into risky projects and become...
 - * ...entrepreneurs (Camerer-Lovaglio)
 - * ...CEOs (Malmendier-Tate)
 - * ...traders (Odean)
 - If overoptimism on average, why so little investment in stocks?

- **Malmendier and Tate (2005, 2006, and 2007)**
- Assume that CEOs overestimate their capacity to create value
- Consider implications for:
 - Investment decisions (MT 2005)
 - Mergers (MT 2006)
 - Equity issuance (MT 2007)

Model

Assumptions

1. CEO acts in interest of current shareholders.
(*No agency problem.*)
2. Efficient capital market.
(*No asymmetric information.*)

Notation

V_A = market value of the acquiring firm

V_T = market value of the target firm

V = market value of the combined firm

\hat{V}_A = acquiring CEO's valuation of his firm

\hat{V} = acquiring CEO's valuation of the combined firm

c = cash used to finance the merger

Rational CEO

- Target shareholders demand share s of firm such that:

$$sV = V_T - c.$$

- CEO decides to merge if $V - (V_T - c) > V_A$ (levels).
⇒ Merge if $e > 0$ (differences), where e is “synergies.”
⇒ First-best takeover decision.

- Post-acquisition value to current shareholders:

$$\bar{V} = V - (V_T - c) = (V_A + V_T + e - c) - (V_T - c) = V_A + e$$

$$\Rightarrow \frac{\partial \bar{V}}{\partial c} = 0 \text{ (No financing prediction.)}$$

Overconfident CEO (I)

- CEO overestimates future returns to own firm:

$$\hat{V}_A > V_A$$

CEO overestimates returns to merger:

$$\hat{V} - V > \hat{V}_A - V_A$$

- Target shareholders demand share s of firm such that:

$$sV = V_T - c$$

CEO believes he should have to sell s such that:

$$s\hat{V} = V_T - c$$

Overconfident CEO (II)

- CEO decides to merge if

$$\hat{V} - (V_T - c) - \left[\frac{(\hat{V} - V)(V_T - c)}{V} \right] > \hat{V}_A \text{ (levels),}$$

i.e. merges if

$$e + \hat{e} > \left[\frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V} \right] \text{ (differences),}$$

where \hat{e} are perceived “synergies.”

Propositions

Compare

$$V(c) - (V_T - c) > V_A \quad \text{and}$$

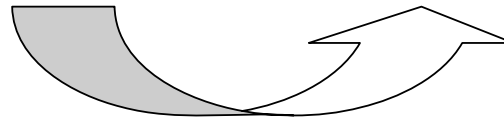
$$\hat{V}(c) - (V_T - c) - \frac{[\hat{V}(c) - V(c)](V_T - c)}{V(c)} > \hat{V}_A$$

1. Overconfident managers do some value-destroying mergers. (Rational CEOs do not.)
2. An overconfident manager does more mergers than a rational manager when internal resources are readily available
3. An overconfident manager may forgo some value-creating mergers. (Rational managers do not.)

Empirical Predictions

Rational CEO

Overconfident CEO



1. On average?
2. Overconfident CEOs do more mergers that are likely to destroy value
3. Overconfident CEOs do more mergers when they have abundant internal resources
4. The announcement effect after overconfident CEOs make bids is lower than for rational CEOs

Data



Data on private accounts

1. Hall-Liebman (1998)
Yermack (1995)

Key: Panel data on stock and option holdings of CEOs of Forbes 500 companies 1980-1994

2. Personal information about these CEOs from
 - Dun & Bradstreet
 - Who's who in finance

Data on corporate accounts

1. CRSP/COMPUSTAT

Cash flow, Q, stock price...

2. CRSP/SDC-merger databases

Acquisitions

Overconfidence

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graph TD; A[Overconfidence] --> B[On private accounts]; A --> C[On corporate accounts];
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On private accounts

- Hold on to options.

Idea: Rational CEO who is

- underdiversified
- risk averse

should

- exercise options early.

On corporate accounts

- Higher probability of acquiring another company, particularly when:
 - Merger has low expected value
 - Manager has lots of cash and untapped debt capacity

Primary Measure of Overconfidence

“Longholder”

(Malmendier and Tate 2003)

CEO holds an option until the year of expiration.

CEO displays this behavior at least once during sample period.

→ minimizes impact of CEO wealth, risk aversion, diversification

Robustness Checks:

1. Require option to be at least $x\%$ in the money at the beginning of final year
2. Require CEO to *always* hold options to expiration
3. Compare “late exercisers” to “early exercisers”

Empirical Specification

$$\Pr\{Y_{it} = 1 \mid X, O_{it}\} = G(\beta_1 + \beta_2 \cdot O_{it} + X^T \gamma)$$

with i company
 t year
 Y acquisition (yes or no)

O overconfidence
 X controls

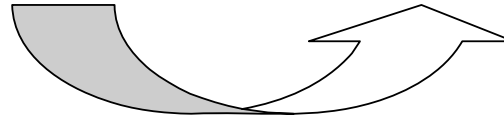
→ $H_0: \beta_2 = 0$ (overconfidence does not matter)

→ $H_1: \beta_2 > 0$ (overconfidence does matter)

Empirical Predictions

Rational CEO

Overconfident CEO



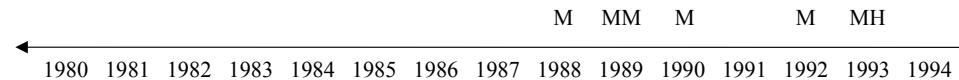
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Identification Strategy (I)

Case 1:

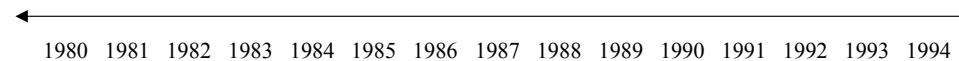
Wayne Huizenga (Cook Data Services/Blockbuster)

- CEO for all 14 years of sample
- Longholder



J Willard Marriott (Marriott International)

- CEO for all 15 years of sample
- Not a Longholder



AND

Case 2:

Colgate Palmolive

- Keith Crane CEO from 1980-1983 (Not a Longholder)
- Reuben Mark CEO from 1984-1994 (Longholder)

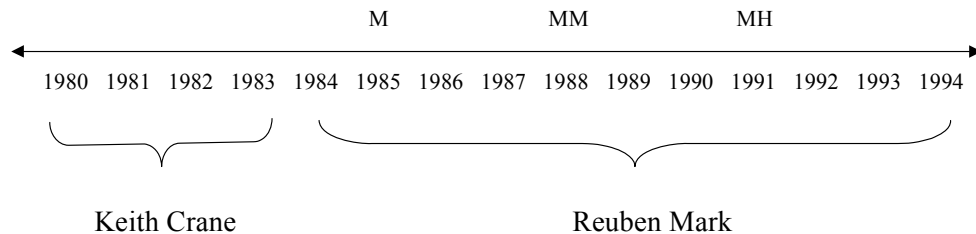


Table 4. Do Overconfident CEOs Complete More Mergers?

Longholder = holds options until last year before expiration (at least once) Distribution: Logistic. Constant included. Dependent Variable: Acquisition (yes or no); Normalization: Capital.			
	logit with controls	random effects logit	logit with fixed effects
Size	0.8733 (1.95)*	0.8600 (2.05)**	0.6234 (2.60)***
Q _{t-1}	0.7296 (2.97)***	0.7316 (2.70)***	0.8291 (1.11)
Cash Flow	2.0534 (3.93)***	2.1816 (3.68)***	2.6724 (2.70)***
Ownership	1.2905 (0.30)	1.3482 (0.28)	0.8208 (0.11)
Vested Options	1.5059 (1.96)*	0.9217 (0.19)	0.2802 (2.36)**
Governance	0.6556 (3.08)***	0.7192 (2.17)**	1.0428 (0.21)
Longholder	1.5557 (2.58)***	1.7006 (3.09)***	2.5303 (2.67)***
Year Fixed Effects	yes	yes	yes
Observations	3690	3690	2261
Firms		327	184

Identification Strategy

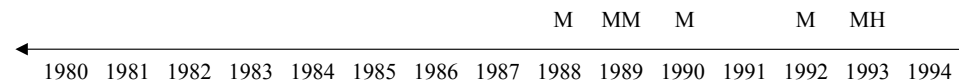
Logit & Random
Effects Logit

Fixed Effects
Logit

Case 1:

Wayne Huizenga (Cook Data Services/Blockbuster)

- CEO for all 14 years of sample
- Longholder

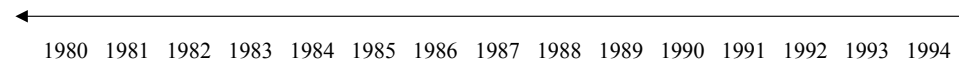


Yes

No

J Willard Marriott (Marriott International)

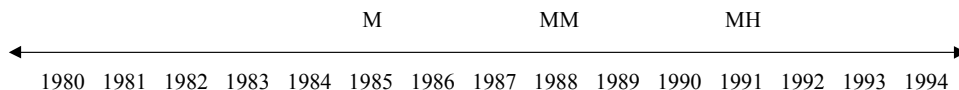
- CEO for all 15 years of sample
- Not a Longholder



Case 2:

Colgate Palmolive

- Keith Crane CEO from 1980-1983 (Not a Longholder)
- Reuben Mark CEO from 1984-1994 (Longholder)



Yes

Yes



Keith Crane



Reuben Mark

Table 6. Are Overconfident CEOs Right to Hold Their Options? (I)

<u>Returns from exercising 1 year sooner and investing in the S&P 500 index</u>	
<u>Percentile</u>	<u>Return</u>
10th	-0.24
20th	-0.15
30th	-0.10
40th	-0.05
50th	-0.03
60th	0.03
70th	0.10
80th	0.19
90th	0.39
Mean	0.03
Standard Deviation	0.27

All exercises occur at the maximum stock price during the fiscal year

Table 6. Are Overconfident CEOs Right to Hold Their Options? (II)

<u>Do "Mistaken" Holders Drive the Acquisitiveness Result?</u>			
Longholder = holds options until last year before expiration (at least once)			
Distribution: Logistic. Constant included.			
Dependent Variable: Acquisition (yes or no) ; Normalization: Capital.			
	logit	random effects logit	fixed effects logit
Size	0.8721 (1.93)**	0.8598 (1.99)**	0.6251 (2.46)***
Q _{t-1}	0.7259 (2.86)**	0.7347 (2.54)**	0.8806 (0.74)
Cash Flow	2.0042 (3.49)**	2.1030 (3.22)***	2.8787 (2.64)***
Stock Ownership	1.5555 (0.51)	1.5853 (0.42)	0.7498 (0.15)
Vested Options	2.8574 (1.36)	1.7361 (0.53)	0.4921 (0.51)
Corporate Governance	0.6220 (3.31)***	0.6823 (2.45)**	1.0343 (0.16)
Longholder: Did OK	1.2015 (0.74)	1.2082 (0.80)	1.1555 (0.27)
Longholder: Should Have Exercised	1.8277 (1.95)*	1.9591 (2.32)**	4.4648 (2.32)**
Year Fixed Effects	yes	yes	yes
Observations	3532	3532	2111
Firms		318	172

Alternative Explanations

1. Inside Information or Signalling

- Mergers should “cluster” in final years of option term
- Market should react favorably on merger announcement
- CEOs should “win” by holding

2. Stock Price Bubbles

- Year effects already removed
- All cross-sectional firm variation already removed
- Lagged stock returns should explain merger activity

Table 7. Control for Returns

Longholder = holds options until last year before expiration (at least once)			
Returns = $\ln(1+\text{returns})$			
Distribution: Logistic. Constant included.			
Dependent Variable: Acquisition (yes or no) ; Normalization: Capital.			
	logit	logit with random effects	logit with fixed effects
Returns _{t-1}	1.4801 (1.61)	1.4467 (1.62)	1.1424 (0.54)
Returns _{t-2}	1.2539 (1.15)	1.2391 (1.01)	1.0474 (0.20)
Returns _{t-3}	1.0635 (0.31)	1.0405 (0.19)	0.9262 (0.35)
Returns _{t-4}	1.3548 (1.40)	1.3452 (1.37)	1.2513 (0.98)
Returns _{t-5}	1.2334 (1.03)	1.2202 (0.95)	1.1539 (0.66)
Longholder	1.5048 (2.33)**	1.6184 (2.83)***	2.4628 (2.56)**
Year Fixed Effects	yes	yes	yes
Observations	3479	3479	2157
Firms		305	173
Regressions include Cash Flow, Q _{t-1} , Size, Ownership, Vested Options, and Governance.			

Alternative Explanations

1. Inside Information or Signalling

- Mergers should “cluster” in final years of option term
- Market should react favorably on merger announcement
- CEOs should “win” by holding

2. Stock Price Bubbles

- Year effects already removed
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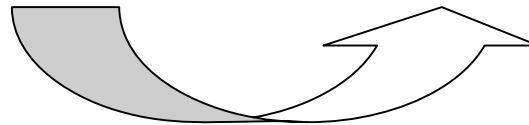
3. Volatile Equity

4. Finance Training

Empirical Predictions

Rational CEO

Overconfident CEO



1. On average?
2. Overconfident CEOs do more mergers that are likely to destroy value
3. Overconfident CEOs do more mergers when they have abundant internal resources
4. The announcement effect after overconfident CEOs make bids is lower than for rational CEOs

Diversifying Mergers

1. Diversification discount

(Lamont and Polk 2002; Servaes 1996; Berger and Ofek 1995; Lang and Stulz 1994)

2. Market understands ex ante

(Morck, Shleifer, and Vishny 1990)

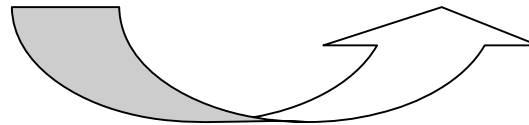
Table 8. Diversifying Mergers

Longholder = holds options until last year before expiration (at least once)			
Distribution: Logistic. Constant included; Normalization: Capital.			
Dependent Variable: Diversifying merger (yes or no).			
	logit	logit with random effects	logit with fixed effects
Longholder	1.6008 (2.40)**	1.7763 (2.70)***	3.1494 (2.59)***
Year Fixed Effects	yes	yes	yes
Observations	3690	3690	1577
Firms		327	128
Dependent Variable: Intra-industry merger (yes or no).			
Longholder	1.3762 (1.36)	1.4498 (1.47)	1.5067 (0.75)
Year Fixed Effects	yes	yes	yes
Observations	3690	3690	1227
Firms		327	100
Regressions include Cash Flow, Q_{t-1} , Size, Ownership, Vested Options, and Governance. Industries are Fama French industry groups.			

Empirical Predictions

Rational CEO

Overconfident CEO



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Kaplan-Zingales Index

$$KZ = -1.00 \cdot \frac{CashFlow}{Capital} + 0.28 \cdot Q + 3.14 \cdot Leverage - 39.37 \cdot \frac{Dividends}{Capital} - 1.31 \cdot \frac{Cash}{Capital}$$

- Coefficients from logit regression (Pr {financially constrained})
- High values → Cash constrained
 - Leverage captures debt capacity
 - Deflated cash flow, cash, dividends capture cash on hand
 - Q captures market value of equity (Exclude?)

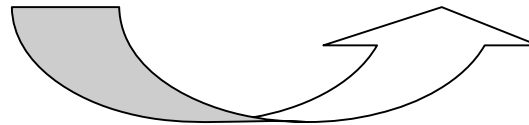
Table 9. Kaplan-Zingales Quintiles

<p>Longholder = holds options until last year before expiration (at least once) Distribution: Logistic. Constant included. Dependent Variable: Acquisition (yes or no); Normalization: Capital. All regressions are logit with random effects.</p>					
	Least Equity Dependent	----->			Most Equity Dependent
	<u>All Mergers</u>				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Longholder	2.2861 (2.46)**	1.6792 (1.48)	1.7756 (1.54)	1.9533 (1.50)	0.8858 (0.33)
Year Fixed Effects	yes	yes	yes	yes	yes
Observations	718	719	719	719	718
Firms	125	156	168	165	152
	<u>Diversifying Mergers</u>				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Longholder	2.5462 (1.89)*	1.8852 (1.51)	1.7297 (1.36)	1.0075 (0.01)	1.0865 (0.18)
Year Fixed Effects	yes	yes	yes	yes	yes
Observations	718	719	719	719	718
Firms	125	156	168	165	152
Regressions include Cash Flow, Q_{t-1} , Size, Ownership, Vested Options, and Governance.					

Empirical Predictions

Rational CEO

Overconfident CEO



1. On average?
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4. The announcement effect after overconfident CEOs make bids is lower than for rational CEOs

Empirical Specification

$$CAR_i = \beta_1 + \beta_2 \cdot O_i + X'\gamma + \varepsilon_i$$

with i company

O overconfidence
 X controls

$$CAR_i = \sum_{t=-1}^1 (r_{it} - E[r_{it}])$$

where $E[r_{it}]$ is daily S&P 500 returns ($\alpha=0$; $\beta=1$)

Table 14. Market Response

Longholder = holds options until last year before expiration (at least once)			
Dependent Variable: Cumulative abnormal returns [-1,+1]			
	OLS (3)	OLS (4)	OLS (5)
Relatedness	0.0048 (1.37)	0.0062 (1.24)	0.0043 (1.24)
Corporate Governance	0.0079 (2.18)**	0.0036 (0.64)	0.0073 (1.98)**
Cash Financing	0.014 (3.91)***	0.0127 (2.60)***	0.0145 (3.99)***
Age			-0.0005 (1.46)
Boss			0.0001 (0.04)
Longholder	-0.0067 (1.81)*	-0.0099 (2.33)**	-0.0079 (2.00)**
Year Fixed Effects	yes	yes	yes
Industry Fixed Effects	no	yes	no
Industry*Year Fixed Effects	no	yes	no
Observations	687	687	687
R-squared	0.10	0.58	0.10

Regressions include Ownership and Vested Options.

Do Outsiders Recognize CEO Overconfidence?

Portrayal in Business Press:

1. Articles in
 - New York Times
 - Business Week
 - Financial Times
 - The Economist
 - Wall Street Journal
2. Articles published 1980-1994
3. Articles which characterize CEO as
 - Confident or optimistic
 - Not confident or not optimistic
 - Reliable, conservative, cautious, practical, steady or frugal

Measuring Press Portrayal

$$\text{TOTALconfident} = \begin{cases} 1 & \text{if ["confident" + "optimistic"] > ["not"} \\ & \text{confident" + "not optimistic + "reliable,} \\ & \text{conservative, cautious, practical,} \\ & \text{steady, frugal]} \\ 0 & \text{otherwise} \end{cases}$$

Independent of the effects of coverage frequency

Market Perception versus CEO beliefs

- TOTALconfident positively and statistically significantly correlated with Longholder
 - Farrell and Mark are TOTALconfident
 - Marriott and Crane are *not* TOTALconfident
- TOTALconfident CEOs (like Longholders) are more acquisitive on average
 - Especially through diversifying mergers
 - Especially when they are financially unconstrained



Overconfidence – identified by CEO *or* market beliefs – leads to heightened acquisitiveness

Table 13. Press Coverage and Diversifying Mergers

Distribution: Logistic. Constant included; Normalization: Capital.			
Dependent Variable: Diversifying merger (yes or no).			
	logit	logit with random effects	logit with fixed effects
TOTALconfident	1.6971 (2.95) ^{***}	1.7826 (3.21) ^{***}	1.5077 (1.48)
Year Fixed Effects	yes	yes	yes
Observations	3647	3647	1559
Firms		326	128
Dependent Variable: Intra-industry merger (yes or no).			
TOTALconfident	1.0424 (0.20)	1.0368 (0.16)	0.8856 (0.31)
Year Fixed Effects	yes	yes	yes
Observations	3647	3647	1226
Firms		326	100
Regressions include Total Coverage, Cash Flow, Q_{t-1} , Size, Ownership, Vested Options, and Governance. Industries are Fama French industry groups.			

Conclusions

- Overconfident managers are more acquisitive.
- Much of this acquisitiveness is in the form of diversifying mergers.
- Overconfidence has largest impact if CEO has abundant internal resources.
- The market reacts more negatively to the mergers of overconfident CEOs

3 Overconfidence

- **Investor Overconfidence: Odean (1999)**
- Does investor overconfidence explain
- Dataset from discount brokerage house
- Follow all trades of 10,000 accounts
- January 1987-December 1993
- 162,948 transactions

- Traders that overestimate value of their signal trade too much
- Substantial cost for trading too much:
 - Commission for buying 2.23 percent
 - Commission for selling 2.76 percent
 - Bid-ask spread 0.94 percent
 - Cost for 'round-trip purchase': 5.9 percent (!)

- Stock return on purchases must be at least 5.9 percent.
- Compute buy-and-hold returns
- Evidence: Sales outperform purchases by 2-3 percent!

TABLE 1—AVERAGE RETURNS FOLLOWING
PURCHASES AND SALES

Panel A: All Transactions				
	<i>n</i>	84 trading days later	252 trading days later	504 trading days later
Purchases	49,948	1.83	5.69	−24.00
Sales	47,535	3.19	9.00	27.32
Difference		−1.36	−3.31	−3.32
N1		(0.001)	(0.001)	(0.001)
N2		(0.001)	(0.001)	(0.002)

- Is the result weaker for individuals that trade the most? No

Panel C: The 10 Percent of Investors Who Trade the Most				
	<i>n</i>	84 trading days later	252 trading days later	504 trading days later
Purchases	29,078	2.13	7.07	25.28
Sales	26,732	3.04	9.76	28.78
Difference		-0.91	-2.69	-3.50
N1		(0.001)	(0.001)	(0.001)
N2		(0.001)	(0.001)	(0.010)

- Huge cost to trading for individuals:
 - Transaction costs
 - Pick wrong stocks

4 Projection Bias

- Beliefs are likely to be systematically biased toward current state
- *Projection bias*. (Loewenstein, O'Donoghue, and Rabin (2003))

- Individual is currently in state s' with utility $w(c, s')$
- Predict future utility in state s
- Simple projection bias:

$$\tilde{w}(c, s|s') = (1 - \alpha)w(c, s) + \alpha w(c, s')$$

- Parameter α is extent of projection bias $\rightarrow \alpha = 0$ implies rational forecast
- Notice: Here people misforecast utility \tilde{w} , not state s ; however, same results if the latter applies

- **Application to purchasing behavior. Conlin, O'Donoghue, and Vogelsang (2006)**
- Consider purchases of cold-weather items
- Main Prediction:
 - Very cold weather
 - → Forecast high utility for cold-weather clothes
 - → Purchase 'too much'
 - → Higher return probability
- Additional Prediction:
 - Cold weather at return → Fewer returns

- Focus on Probability[Return|Order]
- Denote temperature at Order time as ω_O and temperature at Return time as ω_R
- Predictions:
 1. If $\alpha = 0$ (no proj. bias), $P[R|O]$ is independent of ω_O and ω_R
 2. If $\alpha = 0$ (no proj. bias), $\partial P[R|O]/\partial \omega_O < 0$ and $\partial P[R|O]/\partial \omega_R > 0$
- Notice: Do not observe date of return decision

- Purchase data from US Company selling outdoor apparel and gear
 - January 1995-December 1999, 12m items
 - Date of order and date of shipping + Was item returned
 - Shipping address
- Weather data from National Climatic Data Center
 - By 5-digit ZIP code, use of closest weather station
- Items:
 - Parkas/Coats/Jackets Rated Below 0F
 - Winter Boots
 - Drop mail orders, if billing and shipping address differ, >9 items ordered, multiple units same item, low price
 - No. obs. 2,200,073

- Summary Stats:
 - Probability of return fairly high
 - Prices of items substantial
 - Delay between order and receipt 4-5 days

TABLE 1
Summary Statistics by Item Categories

	Gloves/ Mittens	Winter Boots	Hats	Sports Equipment	Parkas/ Coats	Vests	Jackets	All Seven Categories
Observations	484,084	262,610	484,086	146,594	524,831	151,958	145,910	2,200,073
Number of Different Items	106	93	88	233	133	20	37	710
Percent Returned	10.9	15.6	10.8	6.6	22.2	12.8	18.0	14.4
Price of Item (dollars)	29.26	68.33	23.74	74.10	148.58	40.90	106.70	70.10
Percent of Buyer's Prior Purchases Returned	7.2	6.6	6.9	7.2	7.3	6.8	8.2	7.14
Number of Buyer's Prior Purchases	27.3	22.2	23.9	27.7	20.5	21.71	25.3	23.83
Buyer has a Prior Purchase	0.85	0.82	0.83	0.86	0.77	0.83	0.82	0.82
Days Between Order and Shipment	0.42	0.97	0.72	0.94	2.17	1.24	1.13	1.11
Days Between Order and Receipt	4.13	4.66	4.46	4.58	5.92	5.04	4.89	4.84
Ordered Through Internet	0.04	0.03	0.03	0.02	0.04	0.02	0.05	0.03
Purchased by a Female	0.71	0.66	0.71	0.70	0.66	0.72	0.66	0.69
Item Purchased with Credit Card	0.97	0.98	0.98	0.97	0.98	0.98	0.97	0.98
Items in Order	3.5	2.5	3.4	2.9	2.2	2.8	2.3	2.9
Temperature Rating					-10.11		-5.64	
<u>WEATHER CONDITIONS</u>								
Order-Date Temperature (°F)	40.60	39.74	41.48	37.81	43.29	44.76	46.88	41.85
Receiving-Date Temperature (°F)	39.90	38.97	40.72	36.70	42.29	43.20	45.70	40.94
Snowfall on Day Item Ordered (0.1")*	1.79	2.69	1.69	2.65	1.30	1.26	0.63	1.70
Snowfall on Day Item Received (0.1")*	1.58	2.32	1.51	2.35	1.33	1.43	0.66	1.57

- Main estimation: Probit

$$P(R|O) = \Phi(\alpha + \gamma_O \omega_O + \gamma_R \omega_R + BX)$$

TABLE 2

Probit Regression Measuring the Effect of Temperature on the Probability Cold Weather Clothing is Returned
Dependent Variable is Whether Item is Returned (=1 if item returned and 0 otherwise)

	Gloves & Mittens	Winter Boots	Hats	Sports Equipment	Parkas & Coats	Vests	Jackets	All Seven Categories
Order-Date Temperature	-0.00013** (0.00005)	-0.00026** (0.00009)	-0.00020** (0.00005)	-0.00011* (0.00006)	-0.00009 (0.00007)	-0.00048** (0.00011)	-0.00014 (0.00013)	-0.00019** (0.00003)
Receiving-Date Temperature	0.00005 (0.00006)	0.00018* (0.00009)	-0.00005 (0.00006)	-0.00008 (0.00007)	0.00007 (0.00008)	-0.00010 (0.00011)	0.00010 (0.00014)	0.00003 (0.00003)

Price of Item	0.00075** (0.00024)	0.00005 (0.00013)	0.00145** (0.00025)	0.00033** (0.00008)	0.00019** (0.00004)	0.00166** (0.00024)	0.00016 (0.00018)	0.00023** (0.00003)
Item Purchased with Credit Card	0.02042** (0.00250)	0.04337** (0.00418)	0.02876** (0.00244)	0.02395** (0.00191)	0.05893** (0.00405)	0.02294** (0.00535)	0.05312** (0.00568)	0.03531** (0.00137)
Items in Order	-0.00157** (0.00022)	0.00012 (0.00039)	-0.00035 (0.00022)	-0.00078** (0.00028)	0.00196** (0.00033)	-0.00177** (0.00045)	0.00141** (0.00058)	-0.00028** (0.00012)
Clothing Type Fixed Effects	YES	YES	YES	NO ^a	YES	YES	YES	YES
Item Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Month-Region Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year-Region Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	484,067	262,610	484,085	146,403	524,831	151,958	145,910	2,199,950
R-Squared	0.04	0.05	0.07	0.13	0.03	0.03	0.04	0.07

Table presents marginal effects on the probability that an item is returned. Standard errors are in parentheses.

* Statistically significant at the .10 level; ** Statistically significant at the .05 level.

^a Clothing Type information was not provided for sports equipment items.

- Main finding: $\gamma_O < 0$.
 - Warmer weather on order date lowers probability of return
 - Magnitude:
 - This goes against standard story: If weather is warmer, less likely you will use it \rightarrow Return it more
 - Projection Bias: Very cold weather \rightarrow Mispredict future utility \rightarrow Return the item
- Second finding: $\gamma_R \approx 0$
 - Warmer weather on (predicted) return does not affect return
 - This may be due to the fact that do not observe when return decision is made

- Similar estimates for linear probability model with household fixed effects
- (Restrict sample to multiple orders by households)

TABLE 3
 Linear Regression Measuring the Effect of Temperature on the Probability Cold Weather
 Clothing is Returned: With and Without Household Fixed Effects

	Household Fixed Effects	No Household Fixed Effects
Order-Date Temperature	-0.00082** (0.00027)	-0.00039** (0.00013)
Receiving-Date Temperature	0.00017 (0.00029)	0.00002 (0.00015)

Clothing Type Fixed Effects	YES	YES
Item Fixed Effects	YES	YES
Month-Region Fixed Effects	YES	YES
Year-Region Fixed Effects	YES	YES
Household Fixed Effects	YES	NO
Observations	162,580	162,580
R-Squared	0.19	0.10

- Simple structural model of projection bias: Estimates of projection bias α around .3-.4

	Winter Boots	Hats	Parkas & Coats	Vests	Jackets
α	0.3084** (0.0570)	0.4698** (0.00001)	0.3814** (0.0352)	0.0002 (0.0056)	0.4992** (0.0002)

- Other applications?

5 Next Lecture

- Market Response to Biases
 - Investors: Noise Traders
 - Pricing: Behavioral IO
 - Employers: Contracting
- Also Next Week: Empirical Problem Set Handed Out