Disposed to Be Overconfident

Katrin Gödker (Bocconi University)

Terrance Odean (UC Berkeley)

Paul Smeets (University of Amsterdam)

Citrus Finance Conference 2024
Empirical Asset Pricing

It is the middle of the season and your neighbor wants to assess how good his local sports team is this year. What is the first statistic he is likely to look at?

It is the middle of the season and you ask a friend how good his local sports team is this year. What is the first statistic he is likely to report?

San Francisco Giants

(64 - 56)

Golden State Warriors

(36 - 34)

San Francisco 49ers

(5 - 0)

How to investors assess their own abilities?

1. Many investors believe that investment skill varies. (Skill varies in most human activities.)
2. Retail investors are not econometricians.
3. Individual investors are likely to use an assessment measure that is:
    1. Cognitively tractable
    2. Uses information that is comes easily to mind or is readily available
    3. A metric that is similar to those used in other arenas.
4. Investors try to infer their own skill level from their investment successes and failures, e.g., their win-loss record; they simply count how many stocks they sold for a gain and how many for a loss.
5. Due to the disposition effect, investors tend to sell winners more frequently than losers relative to opportunities. (Shefrin and Statman, 1985; Odean, 1998; Weber and Camerer, 1998; Frazzini, 2006).
    1. Also, memory bias leads investors to overestimate the number of stocks they've sold for a gain.
6. Thus counting realized gains and losses leads investors to overestimate their ability—i.e, become overconfident.

1. Empirical evidence from Dutch retail investors

2. Experimental evidence: Subjects who realize more gains than losses are more confident about ability (controlling for actual performance)

3. Theoretical model:
    1. Assumes that investors evaluate performance by counting realized gains & losses
    2. Disposition effect $\longrightarrow$ overconfidence

Empirical Evidence

Dutch retail investors who realized more gains than losses during a year, self-report higher performance relative to other investors during that year, after controlling for actual performance.

Dutch Retail Investors

Survey among Dutch bank clients

- Investment bank clients (response rate: 5.3%)
- July 1, 2020 and July 16, 2020
- Self-reported confidence, i.e., performance relative to other investors in 2019 (we calculate: Elicited Percentile Rank)
- Self-reported realizations in 2019 (we calculate: Recalled Net Gains)

Link to clients‘ portfolio and trading data (for 1,479 investors)

- Link to clients‘ actual portfolio performance in 2019 (we calculate: Actual Percentile Rank)
- Link to clients‘ transactions (we calculate: Net Gains)

Dutch Retail Investors

	(1) Elicited Perc. Rank	(2) Elicited Perc. Rank	(3) Elicited Perc. Rank	(4) Elicited Perc. Rank
Net Gains	0.487***	0.362**		
	(0.15)	(0.15)		
Recalled Net Gains			0.726***	0.625***
			(0.17)	(0.17)
Actual Perc. Rank		0.159***		0.133***
		(0.02)		(0.03)
Order of Elicitation				-1.335
				(2.04)
Constant	55.275***	46.685***	55.883***	50.494***
	(0.62)	(1.21)	(1.22)	(3.87)
N	1,479	1,479	415	415
R^2	0.01	0.06	0.03	0.07

This table contains the coefficients and robust standard errors (in parentheses) of OLS regression.

Dutch Retail Investors

	(1) Elicited Perc. Rank	(2) Elicited Perc. Rank	(3) Elicited Perc. Rank	(4) Elicited Perc. Rank
Net Gains	0.487***	0.362**		
	(0.15)	(0.15)		
Recalled Net Gains			0.726***	0.625***
			(0.17)	(0.17)
Actual Perc. Rank		0.159***		0.133***
		(0.02)		(0.03)
Order of Elicitation				-1.335
				(2.04)
Constant	55.275***	46.685***	55.883***	50.494***
	(0.62)	(1.21)	(1.22)	(3.87)
N	1,479	1,479	415	415
R^2	0.01	0.06	0.03	0.07

This table contains the coefficients and robust standard errors (in parentheses) of OLS regression.

Dutch Retail Investors

	(1) Elicited Perc. Rank	(2) Elicited Perc. Rank	(3) Elicited Perc. Rank	(4) Elicited Perc. Rank
Net Gains	0.487***	0.362**		
	(0.15)	(0.15)		
Recalled Net Gains			0.726***	0.625***
			(0.17)	(0.17)
Actual Perc. Rank		0.159***		0.133***
		(0.02)		(0.03)
Order of Elicitation				-1.335
				(2.04)
Constant	55.275***	46.685***	55.883***	50.494***
	(0.62)	(1.21)	(1.22)	(3.87)
N	1,479	1,479	415	415
R^2	0.01	0.06	0.03	0.07

This table contains the coefficients and robust standard errors (in parentheses) of OLS regression.

Dutch retail investors exhibit selective recall of their realized gains and losses

N = 415	Mean	St. Dev.	*t*-statistic
Recalled # of Realized Gains	4.22	5.34	
Actual # of Realized Gains	2.17	4.39	
Difference (Memory Bias)	2.05	3.78	11.02
Recalled # of Realized Losses	0.82	1.77	
Actual # of Realized Losses	0.73	2.12	
Difference (Memory Bias)	0.09	2.04	0.94

This table reports t-test statistics for participants' recalled number of realized gains or losses and their actual number of realized gains or losses based on their transaction data.

Empirical Evidence

Empirical evidence is correlational.

Both the disposition effect and overconfidence could be caused by the same unobserved investor characteristic, e.g., the desire to maintain a positive self-image.

Our Experiment

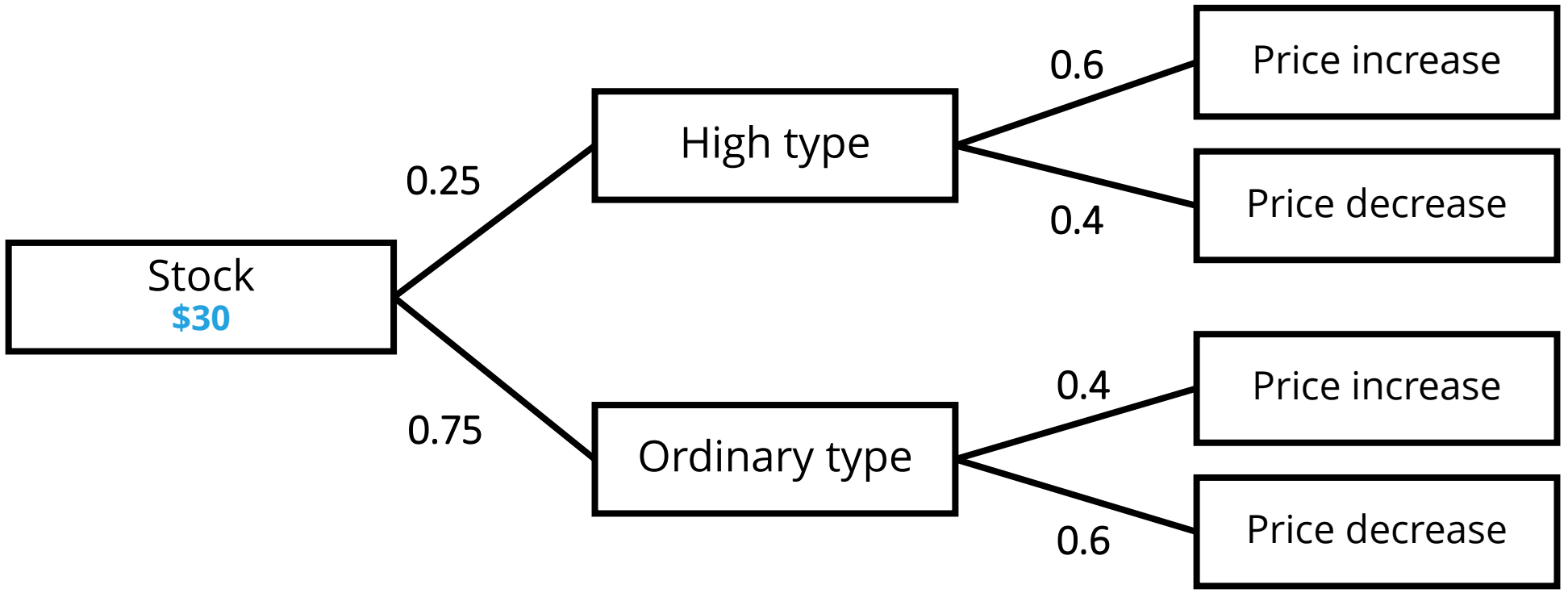
1. Subjects observe 3 periods of prior outcomes for a list of stocks.
2. Some stocks are more likely to have price increases than others.
3. Subjects choose their initial portfolio.
4. Subjects observe next period's price changes.
5. One stock is automatically sold
    1. Treatment: A stock held for a gain is sold
    2. Control: A stock held for a loss is sold
6. Subjects choose replacement stock from another list.

Our Experiment

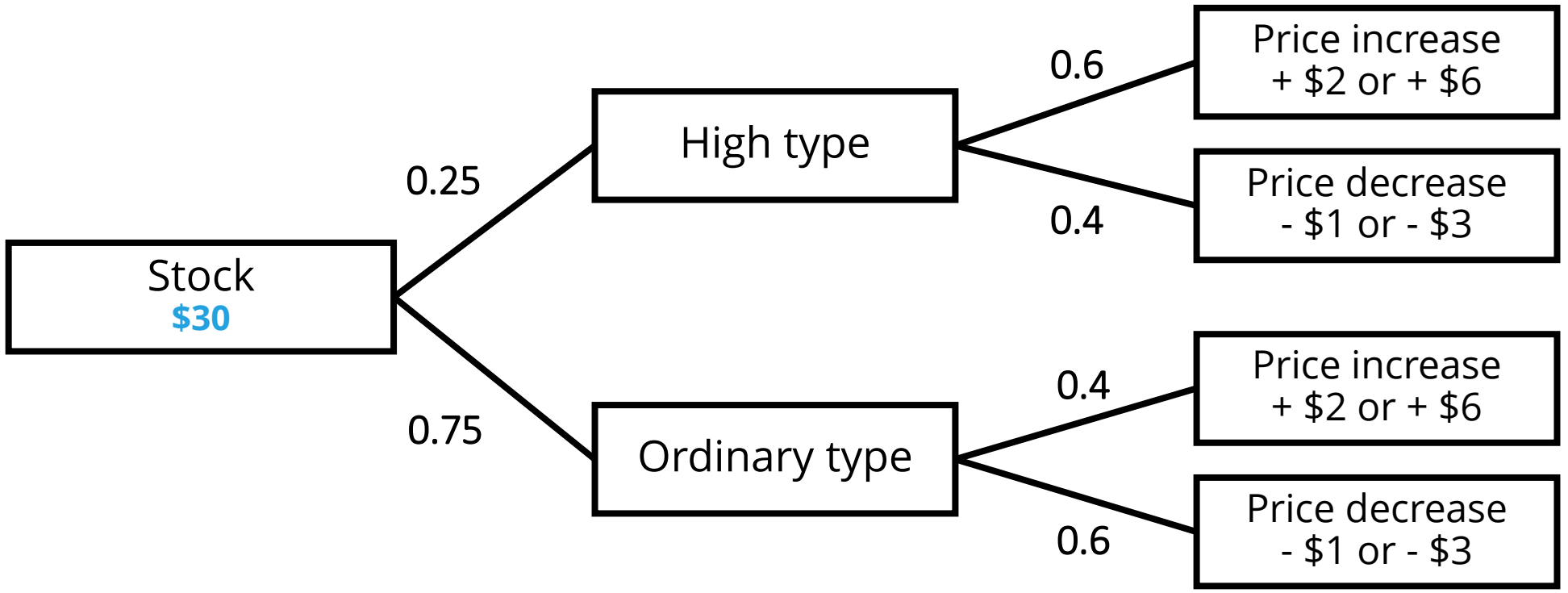
Experimental features:

- ✓ Decision that generates outcomes
- ✓ Exogenous variation in realized outcomes (gains and losses)
- ✓ Environment that facilitates learning about own ability
- ✓ Direct belief elicitation
- ✓ Experiment does not induce a disposition effect. It forces selling patterns similar to those observed with the disposition effect.

Stock Characteristics



Stock Characteristics



Initial Investment Choice

Stock	3 periods ago	2 periods ago	1 period ago	Current price	Your choice
Stock 1	$ 23	$ 22	$ 28	$ 30	☐
Stock 2	$ 32	$ 31	$ 28	$ 30	☐
Stock 3	$ 28	$ 34	$ 31	$ 30	☐
Stock 4	$ 26	$ 25	$ 31	$ 30	☐
Stock 5	$ 28	$ 27	$ 24	$ 30	☐
Stock 6	$ 37	$ 36	$ 33	$ 30	☐
Stock 7	$ 34	$ 31	$ 33	$ 30	☐
Stock 8	$ 16	$ 22	$ 24	$ 30	☐
Stock 9	$ 37	$ 36	$ 33	$ 30	☐
Stock 10	$ 33	$ 32	$ 31	$ 30	☐
Stock 11	$ 34	$ 36	$ 33	$ 30	☐
Stock 12	$ 34	$ 31	$ 33	$ 30	☐
Stock 13	$ 32	$ 29	$ 28	$ 30	☐
Stock 14	$ 37	$ 34	$ 33	$ 30	☐
Stock 15	$ 33	$ 32	$ 31	$ 30	☐
Stock 16	$ 33	$ 32	$ 31	$ 30	☐

...

Portfolio Screen in Each Period

Period 3/5

Your current portfolio:

Stock	Purchase price	1 period ago	Current price
Stock 7	$ 30	$ 26	$ 32
Stock 15	$ 30	$ 42	$ 39
Stock 16	$ 30	$ 38	$ 44
Stock 23	$ 30	$ 29	$ 35
Stock 28	$ 30	$ 30	$ 29

Your current cash holdings: $ 41

Next

Outcome Variable

1 Beliefs about own investment ability relative to others

- Adjustment: Forward-looking nature

What is the likelihood
that you will be ranked
in the top half of the group?

Outcome Variable

2 Beliefs about own ability to select high-type stocks

- To explore possible mechanism that leads to overconfidence
- During the two task trials subjects selected 18 stocks in total

What is your best guess of the number of high-type stocks you have selected?

Descriptive Statistics

	Selling Gains (N = 139)			*Selling Losses* (N = 162)		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Female	0.53	1.00	0.50	0.58	1.00	0.50
Age (in years)	32.83	30.00	11.56	33.34	31.00	11.57
Total number of realized gains	7.74	8.00	0.50	0.98	1.00	1.03
Average portfolio performance (profit in $)	17.92	17.00	10.82	18.01	18.50	11.81
Total number of high-type stocks selected	5.80	6.00	2.11	5.76	6.00	2.13
Subject payment (in $)	2.98	2.97	0.19	2.98	2.98	0.17

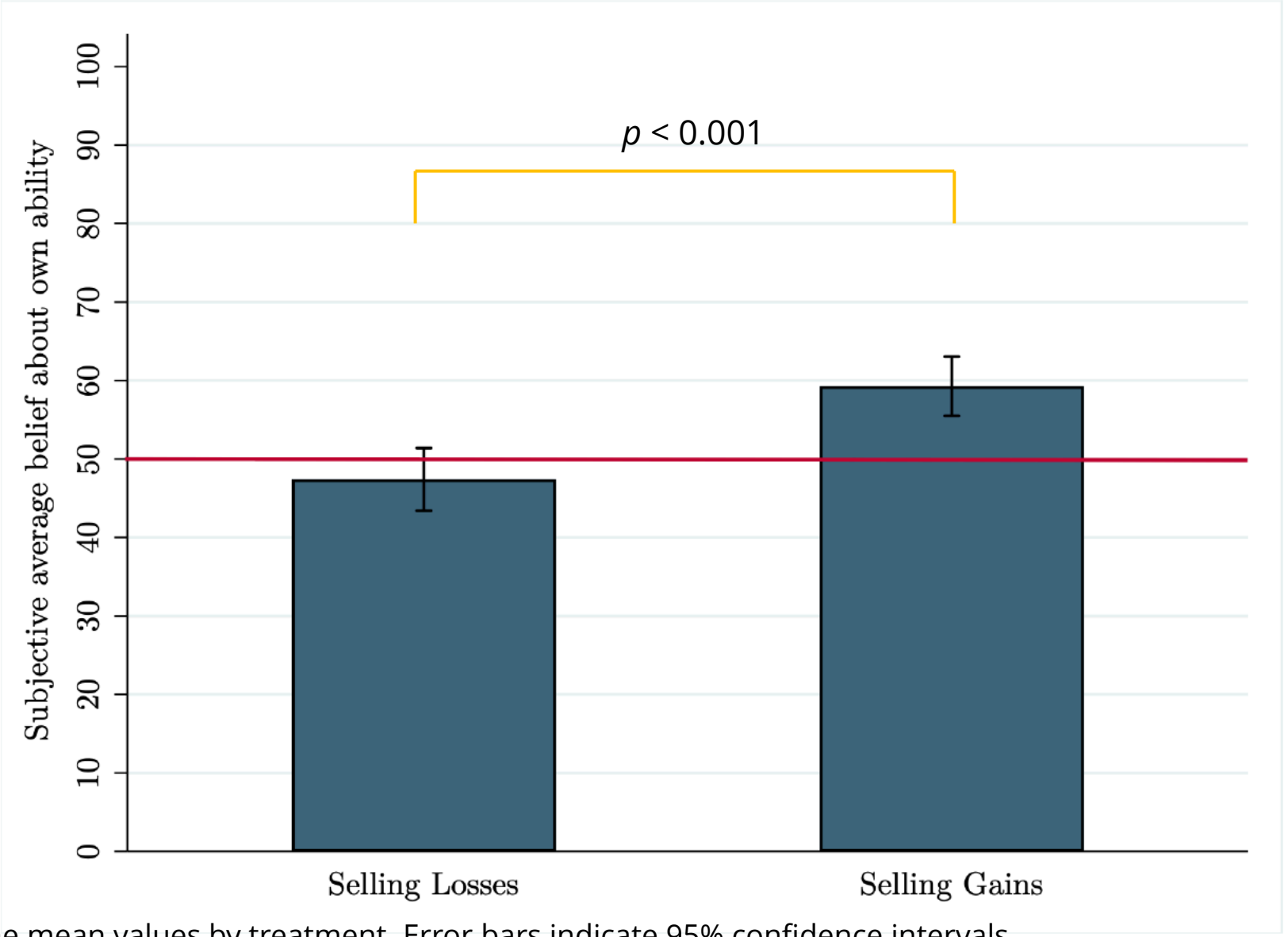
Descriptive Statistics

	Selling Gains (N = 139)			*Selling Losses* (N = 162)		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Female	0.53	1.00	0.50	0.58	1.00	0.50
Age (in years)	32.83	30.00	11.56	33.34	31.00	11.57
Total number of realized gains	7.74	8.00	0.50	0.98	1.00	1.03
Average portfolio performance (profit in $)	17.92	17.00	10.82	18.01	18.50	11.81
Total number of high-type stocks selected	5.80	6.00	2.11	5.76	6.00	2.13
Subject payment (in $)	2.98	2.97	0.19	2.98	2.98	0.17

Descriptive Statistics

	Selling Gains (N = 139)			*Selling Losses* (N = 162)		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Female	0.53	1.00	0.50	0.58	1.00	0.50
Age (in years)	32.83	30.00	11.56	33.34	31.00	11.57
Total number of realized gains	7.74	8.00	0.50	0.98	1.00	1.03
Average portfolio performance (profit in $)	17.92	17.00	10.82	18.01	18.50	11.81
Total number of high-type stocks selected	5.80	6.00	2.11	5.76	6.00	2.13
Subject payment (in $)	2.98	2.97	0.19	2.98	2.98	0.17

Treatment effect on confidence



The bars represent the mean values by treatment. Error bars indicate 95% confidence intervals.

Treatment effect on confidence

	(1) Belief Ability	(2) Belief Ability	(3) Belief Ability	(4) Belief Ability
Treatment	11.872***	11.889***	11.395***	
	(2.79)	(2.79)	(2.79)	
Portfolio Performance		0.194	0.170	0.088
		(0.13)	(0.13)	(0.12)
Male			7.293**	8.329***
			(2.88)	(2.62)
Belief High Types Selected				2.695***
				(0.32)
Constant				
	(2.02)	(3.12)	(3.08)	(3.59)
N	301	301	301	301
R^2	0.06	0.06	0.08	0.21

This table contains the coefficients and standard errors (in parentheses) of OLS regression.

Beliefs are formed based on realizations, not actual performance

	(1) Belief Ability	(2) Belief Ability	(3) Belief Ability	(4) Belief Ability
Treatment	11.872***	11.889***	11.395***	
	(2.79)	(2.79)	(2.79)	
Portfolio Performance		0.194	0.170	0.088
		(0.13)	(0.13)	(0.12)
Male			7.293**	8.329***
			(2.88)	(2.62)
Belief High Types Selected				2.695***
				(0.32)
Constant				
	(2.02)	(3.12)	(3.08)	(3.59)
N	301	301	301	301
R^2	0.06	0.06	0.08	0.21

This table contains the coefficients and standard errors (in parentheses) of OLS regression.

Treatment effect on confidence similar to gender effect

	(1) Belief Ability	(2) Belief Ability	(3) Belief Ability	(4) Belief Ability
Treatment	11.872***	11.889***	11.395***	
	(2.79)	(2.79)	(2.79)	
Portfolio Performance		0.194	0.170	0.088
		(0.13)	(0.13)	(0.12)
Male			7.293**	8.329***
			(2.88)	(2.62)
Belief High Types Selected				2.695***
				(0.32)
Constant				
	(2.02)	(3.12)	(3.08)	(3.59)
N	301	301	301	301
R^2	0.06	0.06	0.08	0.21

This table contains the coefficients and standard errors (in parentheses) of OLS regression.

Treatment effect mediated through beliefs

	(1) Belief Ability	(2) Belief Ability	(3) Belief Ability	(4) Belief Ability
Treatment	11.872***	11.889***	11.395***	
	(2.79)	(2.79)	(2.79)	
Portfolio Performance		0.194	0.170	0.088
		(0.13)	(0.13)	(0.12)
Male			7.293**	8.329***
			(2.88)	(2.62)
Belief High Types Selected				2.695***
				(0.32)
Constant				
	(2.02)	(3.12)	(3.08)	(3.59)
N	301	301	301	301
R^2	0.06	0.06	0.08	0.21

This table contains the coefficients and standard errors (in parentheses) of OLS regression.

Beliefs about # high types selected

	(1) Belief High Types Selected	(2) Belief High Types Selected	(3) Belief High Types Selected	(4) Belief High Types Selected
Treatment	0.956**	0.958**	0.957**	0.956**
	(0.45)	(0.45)	(0.45)	(0.45)
Portfolio Performance		0.029	0.027	0.027
		(0.02)	(0.02)	(0.02)
Actual High Types Selected			0.037	0.036
			(0.11)	(0.11)
Female				-0.008
				(0.46)
Constant	6.864***	6.348***	6.167***	6.173***
	(0.31)	(0.48)	(0.74)	(0.81)
N	301	301	301	301
R^2	0.01	0.02	0.02	0.02

This table contains the coefficients and standard errors (in parentheses) of OLS regression.

Comments:

1. We do not depend upon a particular explanation for the disposition effect.
2. What about attention and salience?
    1. If one increased the salience of a performance metric in the experiment doing so would probably lead subjects to use that metric.
    2. If brokerage firms reported each investors' rank at that firm (e.g., "Last month, you were ranked 4,345,222 out of 6,220,591 investors at Robinhood." some investors would use that metric.
    3. Currently many retail investors in the wild appear to use net realized gains as a performance metric. Doing so leads to a biased self-assessment.

Comments:

1. Biased memory
2. Ignoring drift

Our Model

Model intuition

- Based on Gervais & Odean (2001)
  - Multi-period economy, stocks, private signals (quality based on ability)
- Our model:
  - Investors use a subset of signals (realizations) to assess performance and own ability
  - We introduce the tendency to exhibit a disposition effect (selling decisions exog.)

Three implications:

- Investor overconfidence increases with the degree of the disposition effect
- This effect is particularly strong for low ability investors
- Investor overconfidence, generated by the disposition effect, gives rise to both excessive trading and low trading profits

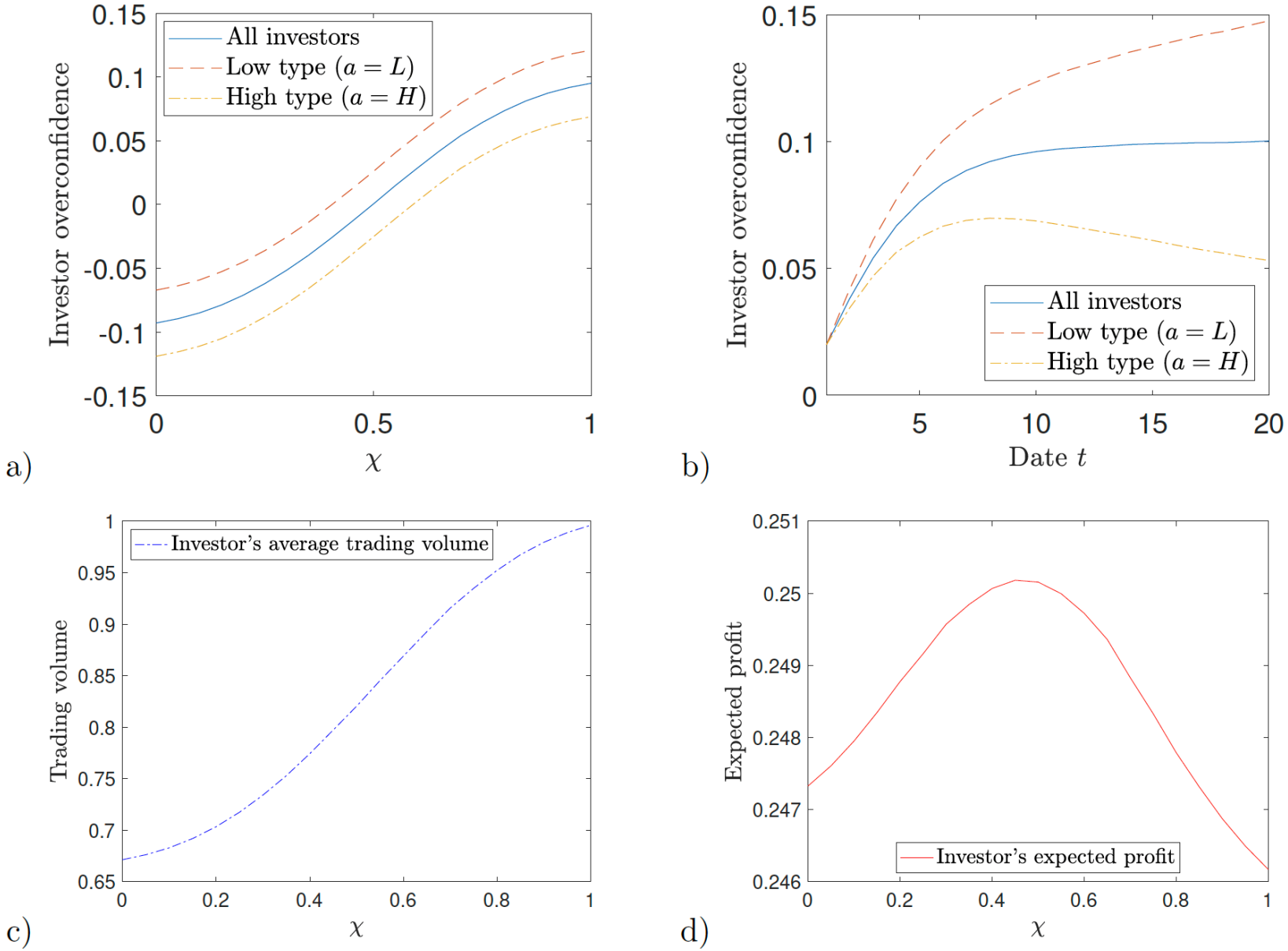


Figure 7. Model implications. We simulate the economy 10,000 times for T periods. At date 0, we draw the investor's ability level. For all panels, $M = 10$, $L = 0.4$, $H = 0.6$, $\sigma_i = 1$, $\sigma_{i,z} = 1$, and $\phi_0 = 0.5$. For Panels a, c, and d, T = 10. For Panel b, T = 21. For Panel b, $\chi = 1$.

Thank you.

Appendix

Result 1 By Gender

Treatment effect on confidence

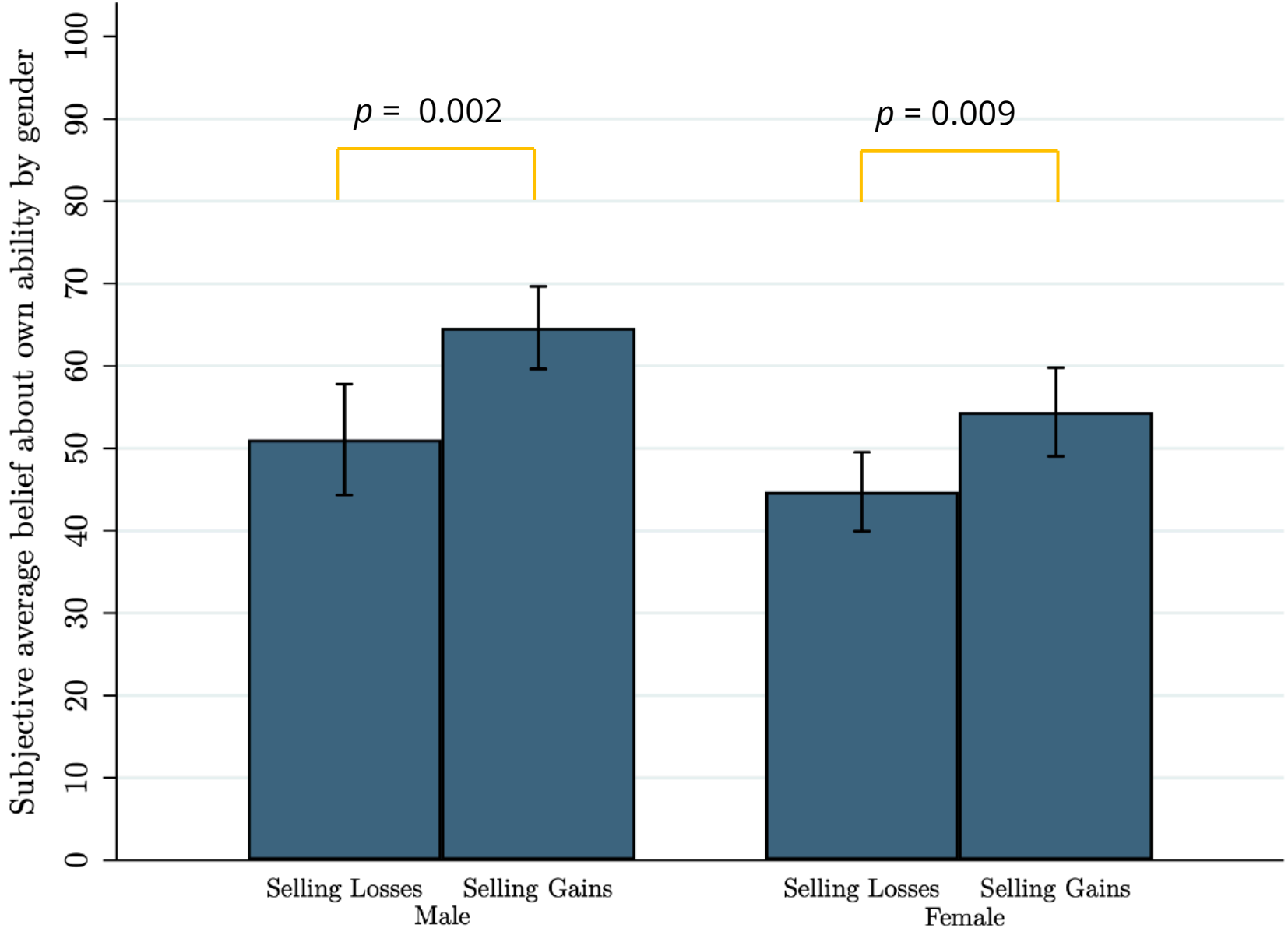


Table V. Beliefs about own ability. This table contains the coefficients and robust standard errors (in parentheses) of OLS regression. The dependent variable is the subjective likelihood in percent of being ranked in the upper half of a group of 10 participants based on performance in the task (from 0% to 100%). *Treatment* is a dummy variable representing our treatment with 1 = Selling Gains and 0 = Selling Losses. *Portfolio Performance* is subjects' average portfolio performance of both investment trials, including paper gains and losses and the cash position and excluding initial endowment. *Female* is a dummy variable indicating subjects' gender with 1 = subject is female and 0 otherwise. *Individual Skill* is subjects' skill to select potential high type stocks. It indicates the number of price increases in pre-periods of selected stocks of subjects' initial portfolio in both investment trials. *Belief High Types Selected* is subjects' reported number of high-type stocks selected (from 0 to 18). *, **, and *** denote significance at the 10%, the 5%, and the 1% level, respectively.

	(1) Belief Ability	(2) Belief Ability	(3) Belief Ability	(4) Belief Ability	(5) Belief Ability
Treatment	11.872***	11.889***	11.455***	11.384***	
	(2.79)	(2.79)	(2.78)	(2.79)	
Portfolio Performance		0.194	0.165		
		(0.13)	(0.13)		
Female			-7.836***	-7.868***	-8.463***
			(2.86)	(2.91)	(2.61)
Individual Skill				0.159	
				(0.26)	
Belief High Types Selected					2.694***
					(0.32)
Constant	47.401***	43.904***	48.981***	49.004***	37.901***
	(2.02)	(3.12)	(3.83)	(5.90)	(3.33)
N	301	301	301	301	301
R^2	0.06	0.06	0.09	0.08	0.21