

Individual Investors' Trading Strategies and Responsiveness to Information

— A Virtual Stock Market Field Experiment* —

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Abstract

We conduct a novel virtual stock market experiment that aims to investigate the motives behind short-term investment behavior at the individual decision-making level. In particular, we focus on individual investors' trading strategies in response to public information — about prices, macroeconomic news, and relevant individual-stock information. The distinguishing feature of our experiment is the use of factual contemporaneous news items directly related to the stocks in subjects' portfolios. We find that more information leads among our experiment participants to more frequent trading; majority of it is positive-feedback following individual stock prices and the market as a whole. Our subjects are driven by psychological motives when deciding their orders; in particular, regret aversion is a habitually common reason for trading and for *not* trading — through the disposition effect.

1 Introduction

1.1 Motivation and Purpose

Theoretical research as well as empirical evidence offer mixed results regarding individual investor trading strategies and motives behind them. Are investors trading on information or are they simply trying to predict prices based on fads and/or behavioral biases? If investors follow certain patterns, what are those — trend-chasing or contrarian? Do investors watch closely news related to stocks in their portfolios *and* respond to them accordingly or perhaps they focus on market-wide macroeconomic information? This experiment aims to investigate links between public information and short-term investment behavior at the individual decision-making level. As these issues are of particular importance in financial markets, we

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designed a virtual stock market experiment to investigate the relevant decision processes directly.

Whereas there are numerous extant studies that use aggregate market data, in a controlled experiment we were able to gather detailed data on individual trading strategies — this was the main motivation behind our project. The other driving force behind our experiment was the need to advance our understanding behind the very motives for trading by individuals, particularly concerning the utilization of and responsiveness to information. We feel conducting such an experiment was necessary to directly examine the relationship between trading behavior and information — we used real-world information and real stocks with real prices, albeit in a virtual stock market environment. Our field experiment may thus be considered to be a fact finding investigation into the short-term behavioral patterns and trading motives of individual investors.

We focus on individual investors' trading strategies and their relation to public information — about prices, macroeconomic news, and relevant individual-stock information. Our principal goals are to address the following issues :

1. Do investors actually take into account contemporaneous public information when making their trading decisions ?
 - Does the amount of information influence frequency of trading ?
 - Do investors adhere to distinctive trading patterns, i. e. do they use positive feedback or negative feedback strategies ?
2. What are the reasons behind specific trading decisions and decisions not to trade ?
 - What kind of strategies are utilized most frequently and are they based on fundamental or behavioral motives ?
 - To what extent do investors employ “wait and see” hold strategies and why ?
3. Are investors prone to behavioral biases and if so, what are they ?
 - Do we observe the disposition effect and if so, when ?
 - Are trading decisions based on regret aversion ?

1.2 Related Literature

1.2.1 Feedback Trading

Empirical investigations into individual investor behavior have thus far focused chiefly on analyses of macro data. Among the most oft-cited papers in this vein is the work of Lakonishok, Shleifer, and Vishny (1994) [13]. The authors find evidence that individual investors use positive feedback trading strategies and attribute it to irrational extrapolation of past growth rates. On the other hand, there is ample evidence for contrarian trading behavior among individual investors, a notion closely related to the so-called disposition effect. The first to provide theoretical background and empirical analysis of the disposition effect were Shefrin and Statman (1985) [16], who proclaim that individual investors tend to employ negative feedback strategies by selling past winners. More recently, and proving the issue to be of importance not only to academics but also to the finance industry professionals, Tanaka (2006) [17] finds evidence that “individual investor activity exhibits a strong negative correla-

tion with the TOPIX”.

In this project, we strive to investigate the issue of individual investor short-term feedback trading from a different, information-based approach. Our results lend partial support for the positive feedback side of the story — we discuss this matter at length in section 4.

1.2.2 The Disposition Effect and Regret Aversion

There exist innumerable theoretical analyses on the relationships between information and strategies of investors. Many of those are interested in the problem of how a decision maker forms their subjective priors when they cannot hold a unique objective probabilistic belief. One of the distinguishable works in this field is Gilboa and Schmedler (1989) [6]; they show that decision makers maximize their utility under worst priors. The authors build a theory of decision maker’s priors around the decision maker’s own scenario of possible future worlds. Their theory predicts that vague information gives rise to multiple beliefs in the decision maker’s mind; furthermore, investors become overly conservative in order to avoid ambiguity.

Epsitein and Schneider (2008) [4] present a theory wherein the arrival of new information makes investors become ambiguity averse through their belief-updating process. In their paper, investors’ attitudes toward good news and toward bad news are asymmetric: they take bad news more seriously than good news. If ambiguity aversion is so crucial to decision making of investors, disposition may be observed broadly as a result of conservative attitude.

An extensive body of research indicates that a large proportion of investors exhibit a tendency to hold on to losing stocks and sell stocks which have gained in value. This type of behavior is usually referred to as the “*disposition effect*”. Shefrin and Statman (1985) [16] were the first to uncover the disposition effect in the context of investor behavior, but the idea originates from the seminal work of Kahneman and Tversky (1979) [12] on the prospect theory, who point to the proneness of decision makers to accept rather risky gambles when that person had not made peace with their losses. On the level of an individual investor, the disposition effect means that the investment pattern of a particular investor exhibits asymmetry: the number of assets sold should be smaller for losing stocks than for winning stocks, relative to a specific reference point. The disposition effect surely is related to regret aversion: in fact, such behavior is prompted by the desire to avoid regret due to losses.

Since those pioneering studies surfaced, a body of research followed lending further support for the existence of disposition investors. Lakonishok and Smidt (1986) [14] find evidence for a relevant volume discrepancy on NYSE and Amex: there is more volume for winners over several time periods (from 5 to 35 months). Ferris, Haugen, and Makhija (1988) [5] empirically analyzed thirty US stocks and showed further evidence for the disposition effect — current volume was negatively correlated with the volume on previous days when stock prices were higher than the current price. Further empirical evidence from the Tokyo Stock Exchange was added by Bremer and Kato (1996) [2]. Also, Odean (1998) [15] found in a survey of some 10,000 individual investor accounts that there was a greater tendency to realize paper gains than paper losses.

The studies mentioned above offer little to no insight into the investor’s decision process. In

our experiment, we approach the disposition effect from a different perspective: we ask our subjects to report whenever they refrained from trading *and* tell us what information they took into account when deciding not to trade.

Another prominent idea that might shed some light on investors' attitudes toward new information is the minimax regret model due to Savage (1951) [18]. Savage shows how a decision maker may be affected by adding an alternative to or discarding an option from a given opportunity set. This is called opportunity dependence, and regret aversion is one kind of breaking IIA (Irrelevance of Independent Alternatives). IIA must hold to satisfy the weak axiom of the theory of preference revelation. The theory of Savage predicts that the decision maker may change their preferences depending on new information because arrival of information changes their opportunity set. The regret aversion can be explained by the changes in the decision maker's reference point — this idea was introduced by Tversky and Kahneman (1991) [19]. Both theories predict that a strategy may become aggressive or conservative when new information arrives; hence a “wait and see” strategy may emerge as a result of a change in an investor's attitude. Thus even if the time to sell has gone, an investor might try and keep their position because they can recover their unrealized loss by waiting for a few days.

A compelling suggestion regarding the strategies related to regret aversion is developed by Hayashi (2006) [9]. He calls attention to the cut-off point used by investors in their dynamic choices. He uncovers a tendency to commit to one's own strategy rather than properly updating beliefs after observing new information — price changes of stocks in investors' portfolios. This makes investors more aggressive and results in time inconsistency. He also provides the threshold point for when investors are affected by new information — prices of stocks they own. The intuition behind this mechanism is that by updating prices of stocks, their cut-off line to sell (or buy) does not depend on any independent distribution, but on the size of anticipated regret when the value of trade is under the cut-off line. The size of regret is decided by the new information, so investors' thresholds depend on ϵ -contamination, the investor's subjective decision weights. Under this assumption, the backward induction cut-off strategies are described in a recursive form; today's strategy is decided by a one step ahead expectation and future strategies are determined by the discounted value of two step ahead expectation under the condition that the one step ahead information is known.

Hayashi (2008) [8] predicts that a decision maker sets their cut-off line so as to equalize the size of two different types of regret. One regret is for a price rise just after selling it (or a drop after just buying it) and the other is a decline in price when they decide to keep it (or an increase in price after not buying). The threshold for the decision maker is determined when they commit to future strategies now. An investor expects their own regret to be brought on by the arrival of day-by-day information and so when a price decline is realized, it makes their regret larger and their cut-off line moves up. This makes the strategies more aggressive compared with no information updating and without commitment.

This theory can help explain the asymmetric attitudes towards declines and rises in stock

prices : why individuals are reluctant to sell when stock prices decline but they try to dispose of stocks when prices are rising. Accordingly, the decision maker is strongly motivated not by the expectation of future stock value itself but by their own regret aversion. We therefore attempt to investigate in the second round of our experiment explicitly whether individual investors are actually motivated by regret aversion : we made the subjects report whenever they used a “wait and see” strategy, i. e. even that they found some information to be of interest, their decision was not to trade that day — postpone buying or selling and keep the current position unchanged.

The rest of this article is organized as follows : in section 2 we describe the experiment design and relevant procedures. We report the main results of interest in section 3 and discuss them further in section 4. We wrap up with some concluding remarks. The experiment instructions are provided in Appendix B.

2 The Experiment

2.1 Basic Data

We have performed two rounds of the experiment, one in March 2008 and one in October 2008. The first round (“Round 1”) spanned four trading days during one week, while the second round (“Round 2”) spanned ten trading days during two weeks. The table below summarizes the basic experiment data.

Table 1 : Basic data.

	Execution Days	Number of Subjects (valid)	University
Round 1	10—13 March 2008	25(24)	Keiai University
Round 2	20—30 October 2008	31(28)	Keio University

2.2 Experiment Design and Procedures

For ease of exposition, the main experimental procedures are itemized below.

- On the first “orientation” day (10th of March for Round 1, and 18th of October 2008 for Round 2, respectively) students were gathered and given a lecture explaining briefly the workings of a stock market. In particular, the relationships between the fundamental value, price and various types of information were explained and their complexities were duly pointed out.
- Following the lecture, the subjects were introduced to the Nomura Virtual Stock Market, where each subject was provided with their own account. A portfolio of ten stocks was chosen and each subject would during the span of the experiment have the opportunity to trade on these stocks (whilst adding new stocks was disallowed, selling all the holdings of a particular stock was not) in the virtual market based on information provided

daily to the subjects' e-mail addresses by the instructors.

- The ten stocks comprising subjects' portfolios were : Toyota, Sony, Softbank, NTT Docomo, Sharp, Toshiba, Yahoo, KDDI, Rakuten and either Nissan or Canon — the last stock differed randomly among participants to prevent possible communication between subjects. The initial position in all of the stocks was a long position of around 50,000 yen ; thus about 500,000 yen was pre-invested in stocks, while another (roughly) 500,000 was available as virtual cash for further orders.
- Starting from Monday the 10th through Thursday the 13th of March (four weekdays) for Round 1, and from Monday the 20th through Friday the 30th of October 2008 (ten weekdays) for Round 2, a daily newsletter with information relevant to the stocks in the portfolio was sent to the participants. Subjects were divided into two groups according to differences in portfolio composition and in the information provided.
- All the subjects also received common, macro data package including details of index (Nikkei 225, TOPIX, and DJIA) and exchange rate (US Dollar vs. Yen) movements on a particular trading day.
- Out of ten stock in the portfolios, identical information about five companies was sent to each subject. For Round 1, subjects in one group received each day five pieces of information about four selected stocks plus ten pieces of information about the Toyota stock. Subjects in the other group received each day five pieces of information about the same three stocks as did the first group and the Toyota stock plus ten pieces of information about one remaining stock. For Round 2, news related to individual stocks were homogeneous throughout all subjects ; we divided participants into two groups by including an extra bundle of five pieces of information regarding economy-wide events of the day in the newsletter sent to one of the two groups.
- Company-specific information sent on a particular day included the closing price and percentage change from the previous day as one piece of information plus four (nine in case of one stock for Round 1) pieces of public information related to the companies in subjects' portfolios that were reported on that day in the media. An excerpt from a typical newsletter is presented in Appendix A. It is taken from the original newsletter in Japanese.
- The information newsletter was sent until a specific time (4:00 pm for Round 1 and 6:00 am for Round 2) on each trading day ; the subjects decided on their trades and made appropriate transactions in the Nomura Virtual Stock Market. The subjects would then indicate in detail which information items propelled them to make their trading decisions, by e-mail sent to the instructors.
- The trades were reflected in the subjects' virtual market portfolios the morning following the day particular buy and sell orders were entered.
- Following the last trading day of the experiment, the subjects were gathered again and the final payments were made, including heterogeneous rewards according to the subjects' trading performance. Subjects were also asked to fill out a final questionnaire on that day.

- The structure of payments to the participants was made up of three components and is summarized in the table below: (i) a uniform payment for participation in the opening lecture and instructional lesson Y_L ; (ii) a predefined daily compensation for proper reporting of information used for trading Y_I ; (iii) performance-dependent compensation after the completion of the experiment Y_X .

Table 2: Structure of compensation (in JPY).

	Y_L	Y_I (*#of days)	Y_X
Round 1	2000	1000(* 4)	$\in [-2000, 2000]$
Round 2	2000	400(*10)	$\in [-1000, 2000]$

A few remarks are in order.

As we used factual contemporaneous information when it was made public, there was no possibility to bias the information in favor of good or bad news.

All our subjects were beginners when it comes to stock market trading. The trades were only virtual and the subjects did understand that they were price-takers. This experiment did not involve trade between subjects and thus there was no incentive for the subjects to communicate with each other. We thus have reason to believe our results indeed reflect individual decision making processes.

The decision to divide subjects into groups — based on number of information items about Toyota in Round 1 and on extra macroeconomic news in Round 2 — was taken to further investigate the relationship between the volume of information and frequency of trading and to discourage communication between subjects that might have been hard to avoid were the information packages sent to the participants completely identical. As no significant effects due to the above-stated differences in information received were found, we suppress this issue in the remainder of this paper. We believe these measures were innocuous and do not influence our findings.

2.2.1 Additional Features in Round 2 of the Experiment

While in Round 1 of our experiment we asked the participants to report only which news they found useful when placing particular buy and sell orders, we expanded the required reporting protocol in Round 2 of the experiment. In particular, we asked that the subjects report also their judgments regarding the meaning and accuracy of received information items. In addition, the subjects were asked to report the kind of strategy that most closely fits their trading choices — they had to choose one from a list of possible reasons for a trade. In order to illustrate this reporting process, let us consider an example of a typical report from a participant below :

D — D03/G/S; M01/VG/AS — UV,

where “D” is the code for NTT Docomo, “D03” is the code for the third news item regarding the company in question from the first trading day, “M01” stands for the first day’s first macroeconomic data (the Nikkei 225), “G” and “VG” represent the subject’s judgment that

the news were good and very good, respectively, “S” and “AS” stand for the subject’s judgment that the news were accurate and very accurate, respectively, and finally, “UV” represents the subjects strategy, in this case “undervalued”. The list of available strategies is presented below in section 3.2.1.

3 Results

We divide this section into two parts, corresponding to the two main issues we are interested in, i. e. regarding (i) basic data on trading and information usage, (ii) reasons for trading and employed strategies, including behavioral stories.

3.1 Information and Trading Patterns

3.1.1 Trading Frequency and Information Usage

First we report some basic results on the aggregate frequency of trades, per-subject average trading frequency, both aggregate and per-subject usage of information, and the relationship between amount of used information and number of trades. When calculating the number of information items used for making buying and selling decisions, we counted the same information twice if it was used for two separate orders — the same piece of information has potentially different implications for different stocks; also, in the data below we do not include information reported to have been used for “hold” strategies. The two tables below summarizes these findings.

Table 3 : Trading frequency.

	#Days	#Trades	Avg. #Trades	Avg. #Trades per Day
Round 1	4	259	10.79	2.70
Round 2	10	441	15.75	1.58

Table 4 : Reported information usage.

	#Days	#News	Avg. #News	Avg. #News per Day
Round 1	4	633	26.38	6.59
Round 2	10	1086	38.79	3.88

It is worth mentioning that an average subject’s number of trades per day and number of information items reported differ considerably between Round 1 and Round 2 — during the shorter Round 1 subjects trade much more and report that they used more information than during the longer Round 2. Interestingly though, the ratios of average number of news reported to average number of trades are remarkably similar for both rounds : 2.44 for Round 1 and 2.46 for Round 2 : the average “information per trade” index does not change with the trading horizon.

We have computed several aggregated across subjects correlation coefficients with respect to the relationships between frequency of trades T , directions of the trades B (Buy), and number of reported news items taken into account N . They are summarized in the table below; the asterisks in parentheses “(*)” and “(**)” indicate 5% significance of the Pearson product-moment correlation coefficient test for the directional and non-directional hypotheses, respectively.

Table 5: Correlations between trades and information.

	$\rho[T, N]$	$\rho[B, N]$
Round 1	0.778(**)	-0.106
Round 2	0.321(*)	-0.310

Thus in both rounds of the experiment, subjects who on average used more information to make their decisions also traded more frequently. Moreover, the more information was used, the larger was the frequency of sell orders.

3.1.2 Feedback Trading

Now we turn to the presentation of results regarding feedback trading strategies. We distinguish here between three types of feedback trading, whether positive or negative: (i) absolute FA — where reported information is not taken into account; (ii) individual stock price FI — where we look at the direction of the trade and compare it with the price change of the stock whenever it was reported as used; (iii) market index FM — where we compare the direction of the trade with the Nikkei 225 index change whenever it was reported as used. In the table below, we report percentage values for positive feedback trading.

Table 6: Feedback trading.

	FA	FI	FM
Round 1	61.39%	74.58%	90.48%
Round 2	63.91%	65.03%	71.95%

Thus our subjects used more positive than negative feedback trading strategies, although the numbers do not point to any extremeness of this phenomenon. When the trading horizon is shorter, those who watch both individual stock prices as well as the market index movements engage in positive feedback trading more often than it is the case for longer trading period.

Next, we report on the correlations (again, aggregated across subjects) between the incidence of positive feedback trading J and (i) frequency of orders for which individual stock prices were reported as used P , (ii) frequency of orders for which market index data were reported as used M , and (iii) total number of information items reported to have been used N ; the asterisks in parentheses “(**)” indicate 5% significance from the Pearson product-moment correlation coefficient test for the non-directional hypothesis.

Table 7: Feedback correlations.

	$\rho[J, P]$	$\rho[J, M]$	$\rho[J, N]$
Round 1	0.627(**)	0.104	-0.062
Round 2	0.392(**)	0.187	0.039

While there is no discernible connection between total number of information used and feedback trading, we can see there is considerable correlation between positive feedback trading and using prices for investment decisions among our participants. It is perhaps beneficial to report here that in majority of cases, subjects did not report that they had used either individual stock price data or the Nikkei 225 index when deciding their trades — the former were reported to be used in about 23% and 41% of trades in Round 1 and Round 2, respectively, while the latter in about 16% of trades in Round 1 and roughly 19% of trades in Round 2. Hence those who watched for more of specific company-related information traded according to their judgment of what the influence of that information on prices would be (no feedback effects) whilst those who focused more on price movements did exhibit the tendency to feedback-trade, mostly positively.

3.2 Trading Motives and Strategies

This section concerns mainly Round 2 of our experiment, where the reporting requirements from subjects were much richer than in Round 1.

3.2.1 Reasons for Trading

First we report on the distribution of reasons for trade given by the experiment participants. The participants had the choice of ten trading strategies plus a “wait and see” report that corresponds to a hold strategy — all the available choices are listed below.

- UV — based on fundamental reasons, the stock is undervalued;
- OV — based on fundamental reasons, the stock is overvalued;
- LK — based on personal preference for the company, the stock is undervalued;
- DK — based on personal preference for the company, the stock is overvalued;
- XB — expecting a price increase in the future, buy;
- XS — expecting a price drop in the future, sell;
- RP — after a price drop, sell to avoid regret due to having to sell later at an even lower price;
- RN — after a price increase, buy to avoid regret due to having to buy later at an even higher price;
- RB — after a price drop, buy to avoid regret due to having to buy later at a higher price;
- RS — after a price increase, sell to avoid regret due to having to sell later at a lower price;
- WS — wait and see: based on reported news, decision to hold the stock and postpone trading.

When subjects did trade — we thus exclude the “wait and see” WS strategies for now — their reasons were distributed as illustrated in the following table.

Table 8: Reported reasons for trade (percent).

UV	OV	LK	DK	XB	XS	RP	RN	RB	RS
4.90	0.98	1.96	0.25	21.57	13.48	13.48	19.36	8.09	15.93

As can be seen, more than half the time subjects cited regret-related reasons for trading — the four reasons connected with regret aversion amount together to almost 57% of all the choices. Reasons based on future price expectations alone (XB and XS) comprise about 35% of the responses. As we verified, the frequency of regret reports was not significantly different for trades after price increases from trades after price declines:

Table 9: Welch’s t-test — “Regret” strategies and changes in prices

Regret	Price Up	Price Down	Nikkei Up	Nikkei Down
Sample	47	43	6	4
Average	29%	30%	48%	61%
Variance	0.050	0.058	0.025	0.049
Welch’s t	0.256		1.020	
DoF	86		8	

3.2.2 Reasons for Not Trading: “Wait and See” Holding Strategies

When a subject of our experiment (Round 2) decided not to trade even though they found some information sent to them useful, they reported a holding strategy “wait and see” for a particular stock in question on a given trading day. For 650 cases the subjects had to make a decision, 209 times they decided to not trade and reported they were going to “wait and see”. This means that roughly once in three times (exactly 32.15%) trading was avoided by our participants.

Statistical Significance Test

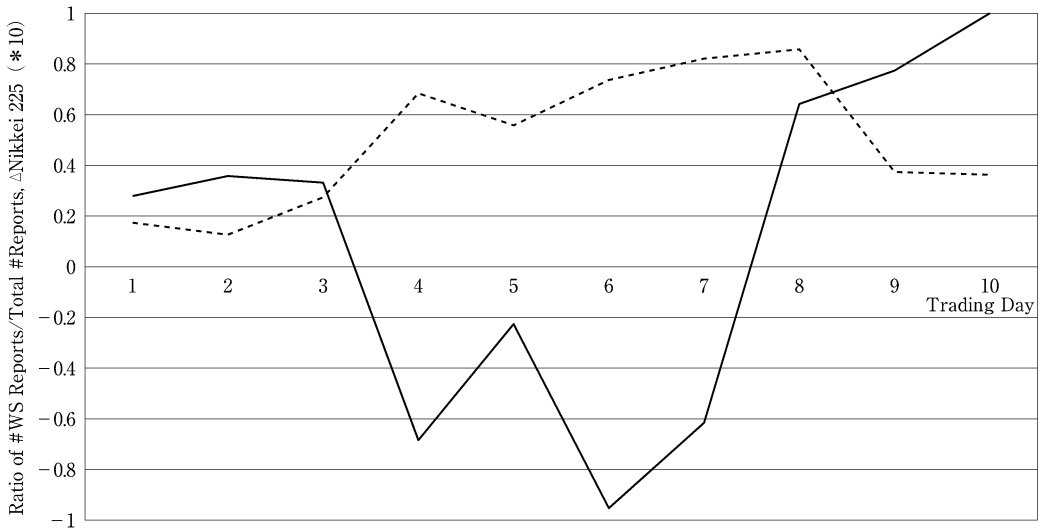
The apparently large number of “wait and see” reports compelled us to examine this issue more closely. We thus compiled a chart of changes in stock prices against the ratio of “wait and see” reports to the total number of reports, for individual portfolio stocks (for the common 9 out of 10 stocks in subjects’ portfolios) and for the Nikkei 225 index for each of the trading days. This made it possible for us to test whether there is a significant relationship between the direction of price changes and the frequency of “wait and see” strategies, and thus to check for the disposition effect on the sell side.

We have performed the Welch’s t-test to check if the frequency of “wait and see” reports was larger after individual stock price decreases than after increases. The two-tailed test indicates at 5% significance level (*) that indeed the subjects refrained from trading more

Table 10: Welch's t-test — "Wait and See" reports and changes in prices.

W&S	Price Up	Price Down	Nikkei Up	Nikkei Down
Sample	47	43	6	4
Average	25%	34%	36%	70%
Variance	0.002	0.509	0.068	0.012
Welch's t	2.080 (*)		2.790 (*)	
DoF	86		8	

Figure 1 Incidence of "Wait and See" Reports (dotted line) vs. Nikkei 225 Changes (solid line)



often after individual stock price drops. Moreover, the same was true for the case of Nikkei 225 index. The table above summarizes these results.

The figure presents these findings graphically, for the case of Nikkei 225 index.

4 Discussion

4.1 Information, Prices and Feedback Trading

Based on our results, participants of our experiment did find useful and did take into account when making their trading decisions the information that was provided to them. Those, who studied that information more carefully — i. e. looked at more pieces of information — traded more than those who paid relatively less attention to the information. Moreover, those who studied prices in particular, turned out to be mostly positive feedback traders. The shorter the trading horizon, the more pronounced this effect appears to be.

In a related project focusing on bubbles in laboratory markets, Hirota and Sunder (2007) [10] point to the prevalence of short-term oriented traders using forward induction rather than the rational backward induction based on fundamentals. Consistently with this observa-

tion, those participants of our experiment who reported extensive use of price data employed mostly positive feedback trading strategies suggesting that their expectations of future prices were formed through trend extrapolating and related “technical” devices, perhaps because of their simplicity relative to the backward induction process.

The issue of whether individual investors are positive feedback or negative feedback traders, if either, is not resolved and does need further research. Amidst several theoretical papers that our experimental results relate to is the seminal work of De Long, Shleifer, Summers, and Waldmann (1990) [3]. Our results lend support to their theory. In their model, early buying or selling by rational informed speculators triggers positive-feedback trading from less informed investors. This type of behavior by an individual trader — a “less informed investor”, is exactly what characterizes the participants of our experiment, who trade on public news and in that they most probably follow the trades of early-informed speculators or insiders.

On the empirical front, our results support the findings of both Bange (2000) [1] for the American stock market, who claims that “shifts in equity portfolio holdings reflect positive feedback trading”, as well as Kamesaka, Nofsinger, and Kawakita (2003) [11], who find in the Japanese market that “individual investors appear to be short-term positive feedback traders”. What is more important, we were able to investigate and identify the motives behind such trading behavior. Specifically, we were able to examine whether public information was taken into account, and if so, what kind of public information it was — information about prices.

4.2 The Disposition Effect and Regret Aversion

It is rather striking that in more than half of the reported cases, our subjects described some form of regret aversion as their main reason behind trading. Regret is undoubtedly an emotional reaction, the very pain one experiences when they face negative effects of their own decisions, and regret aversion, simply put, is the fear of that psychological pain — fear to be sorry. Our subjects thus engaged in “emotional investing” rather than rational decision making. Even though they did account for information when deciding their trading strategies, emotions turned out to be the ruling factor behind their decisions. Moreover, those who refrained from trade did so also, arguably, for fear of regret. According to the model of Shefrin and Statman (1985) [16], disposition effect has four components: (i) Prospect Theory — it predicts the disposition effect when the proceeds realized are held and not rolled over into another investment period; (ii) Mental Accounting — it clarifies conditions under which the disposition effect holds when realization profits are reinvested; (iii) Regret Aversion — it provides a *reason* for why investors may resist the realization of losses as it proves their original judgment to have been wrong; and (iv) Self-Control — it explains the rationale for methods investor use to force themselves to realize losses: there is an internal conflict between a rational part and a more primitive emotional part of the investor which may result in insufficient self-control to close a position at a loss, despite the trader’s awareness of riding losers being irrational. In case of this experiment, we presume regret aversion is the main

suspect behind the participants' tendency to hold on to losing stocks. By choosing to "wait and see" rather than sell a stock that has declined in value our subjects avoided making their paper losses a reality.

One possible, and a viable one, critique that arises in the context of testing for the disposition effect is that too much information obstructs the possible impact of the disposition effect. Our experiment indeed demands from the participants a lot of attention to be paid to information. Thus the evidence we find for the disposition effect in spite of the large amount of information the subjects had to process signifies its robustness and prevalence.

5 Concluding Remarks

Individual investors who consider investing in stocks have a lot of information to process: they are bombarded with a flood of information, some of which might be relevant for their decisions, some of which might be not. Perhaps instead of trying to obtain that information people simply follow their gut-feelings or a fad and are thus "behavioral" traders. There are numerous theories as well as empirical studies in support of either thesis and most probably it is the combination of information and sentiment that drives individual investor behavior in the end. Our study offers a new, experimental approach based on real-world information provision to add to the body of extant research.

We find support for the idea that individual investors are driven by psychological factors in their financial decision making. In particular, regret aversion appears to be a very robust and prevalent behavioral trait, manifesting itself in both trading and not trading—the latter through the disposition effect. In future experimental research, it would be advisable to confront regret aversion with other salient behavioral phenomena such as biased confidence. Regret aversion is an inherently "negative" motive for making decisions; on the other hand, overconfidence being a widely documented phenomenon in itself, is a rather "positive" motive that propels investors to trade aggressively.

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Appendix

- A Excerpt form an information newsletter.
- B Experiment Instructions (Round 2)
- C Figures

A. Information Newsletter — Example

M71 [日経平均] 7,621.92円+459.02 (+6.4%)

M72 [TOPIX] 784.03+37.57 (+5.0%)

M73 [円レート] 97.67-97.72+3.13 (円安)

M74 [NY ダウ] 9,065.12+889.35 (+10.88%)

A71 [28日の終値] 3,170+230 (+7.82%)

A72 日産ゴーン社長, 金融危機対策「中銀の企業融資必要」日経フォーラム「世界経営者会議」
対談にて2008/10/28 11:44 Nikkei Net

...

A75 トヨタ, カローラ値下げ 国内販売の底上げ狙う2008/10/28 21:18 朝日新聞

...

...

...

F71 [28日の終値] 310+9 (+2.99%)

F72 東芝, 2値技術を用いた NAND 型フラッシュメモリ-16種類を製品化し順次量産開始2008
/10/28 12:46 Nikkei Net (東芝 プレスリリース)

...

F75 東芝, au 向け携帯電話機「W65T」を製品化 2008/10/28 17:18 毎日新聞

B. Experiment Instructions

2008年10月18日 SFC 実験 被験者用インストラクション

謝礼金について

これは, 本日のインストラクション, それに続く10日間の運用報告, および運用結果による最終的に卸金の決定が行われます。よく理解して臨んでください。

- 最高額は, 2000円+4000円+2000円=8000円となります。運用結果によっては, この最高額が全員に出ることもあります。最低額は, 2000円+4000円-1000円=5000円となります。
- 連日, 取引を全く行わず, その理由について何も報告しなかった場合, 本日の謝礼金を含め, 何も支払われません。
- この実験を独立で行うと, 40人程度であっても, よく似た運用をする被験者が全くいないことが, 事前の実験でわかっています。2人以上の被験者の運用が極めて似ている場合, まったく同じでなくても, 2人ともに謝礼金が支払われません。被験者同士の意見や情報交換は

行わず、各自で取引を行ってください。

- 初日までにアカウントに入れなかった、などの場合は、インストラクションに集中していなかった、質問をしなかったという判断で、実験を続行することはできません。ただし初日（10月20日）の一定の時間だけ、メールで相談をすることができます。（17時～19時）

基本的な構造

（10月18日分）2000円+（10月21日～10月31日分）400円×10+（11月3日の運用結果）運用実績に応じた謝礼金 マイナス1000円～プラス2000円

1. 本日、インストラクションを受けた人は、現金2000円が支払われます。
2. あなたが、バーチャル取引を行い、その取引について情報を送るたびに、一日400円が支払われます。毎日取引を行い、データを送付した場合、運用結果に関わらず、3000円が支払われることとなります。
3. また、取引を全くしたくない場合、（ポジションをそのままにして様子見にする場合）、どの情報を用いて、様子見戦略を取るよう判断したのかを報告してください。報告することにより、謝礼金が支払われます。
4. 毎日全銘柄を取引する必要はありません。自分が売買したいと思う銘柄だけを動かし、用いた情報、その理由、戦略、受け取った情報以外に受動的に得た情報について、すべて回答してください。
5. 取引をすると、取引コストがわずかにかかります。それは、現実の市場でも同じです。10日間ありますので、そのことを頭の片隅において、取引をしてください。
6. 取引内容は、一日一度だけ訂正することができます。その場合は、謝礼金が1回の修正について100円減らされます。できるだけ訂正をしないようにしてください。また、訂正する場合、その理由を簡単に書いて送ってください。
7. 運用最終日は10月31日です。最終的な謝礼金の決定は、あなたの運用結果に連動して、11月4日（火）に確定します。クラス内の順位ではありませんので、注意してください。被験者の多くが0円になることもあれば、被験者の全員が2000円を得ることもあります。
8. 運用結果により、ポートフォリオを放置しておいた場合よりも、

-10%以下	→	-1000円
-10%～-5%	→	-500円
-5%～0%	→	0円
0%～5%	→	+500円
5%～10%	→	+1000円
10%～15%	→	+1500円
15%以上	→	+2000円

ポートフォリオについて

あなたは、自分の口座とパスワードをもらいます。ポートフォリオが含んでいる銘柄は（格好内は銘柄コード）

- A (7203) トヨタ
- B (6758) ソニー
- C (9984) ソフトバンク
- D (9437) エヌティティドコモ
- E (6753) シャープ
- F (6502) 東芝
- G (4689) ヤフー
- H (9433) KDDI
- I (4755) 楽天
- J (7201) 日産 or (7751) キヤノン

からできています。また、一定程度現金が残されています。

ポートフォリオの構成は、全員が同じというわけではありません。口座内容を開けて確認してください。本日実験者は、SFCの食堂内に全員からの口座確認メールが来るまで待機していますので、できるだけ本日中に確認してください。

取引と情報についての注意事項

- 毎日、マクロ情報と、10銘柄中5銘柄についての情報が送られます。我々が送付する情報は、現実には前日の午後4時から当日の4時ごろまでに得られた情報です。(3時にマーケットが閉まるため、株価や売買高をすべて収集すると、4時が一つの区切りとなります)遅くとも5時にはすべての情報が送られます。マクロデータは毎日4個か9個送られます。個別銘柄データは、その日のニュースが多かった5銘柄に決まり、各銘柄について5個ずつです。選ばれた銘柄については、終値および上昇率が必ず届きます。ある銘柄は毎日のようにデータが送られてきますが、ある銘柄は時々しか送られてきません。
- 情報をみたら、できるだけ早く、他の情報が入ってこないうちに、あなたの口座を開けて取引をしてください。
- 取引が済んだら、取引に用いた情報と、その理由、あなたの戦略に最も近いものを選んで、一緒に送ってください。送信は、

“D—D03/G/S; M01/VG/AS—XS”

(“銘柄—使った情報/意味/確度; 使った情報/意味/確度—買った理由”(記号表を参照))
のように送り、エクセルファイルに、あなたの戦略の覚書として記入しておいてください。
このファイルを最終的に我々に提出してもらいますが、このファイルをきちんとつけることで、あなた自身の戦略や、戦略の変化をチェックすることができます。

- これは、現実の取引ではないので、あなたの取引が市場に影響を与えることは全くありません。
- あなたのポートフォリオをそのまま維持していた場合の運用結果と比較して謝礼金が決まりますので、市場全体が値上がっているとか、市場全体が値下がっているという問題により、運用益が大きく変化するという影響は受けません。

- 取引コストによる多少の目減りをカバーするような謝礼金のスケジュールとなっています。取引することに消極的である必要はありません。

C. Figures

