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Framing and the disposition effect in a scopic regime

Framing and the disposition effect in a scopic regime^{*}

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Abstract This paper studies the influence of framing on the relationship between trading in a transparent trading environment (a “scopic regime”) and the disposition effect. In principle, the recent literature agrees that social interactions alter investors’ disposition effect. However, while some studies argue the disposition effect increases in a social environment, others provide evidence that the disposition effect decreases under a scopic regime. We show that the framing of the decision problem on social trading platforms affects the sign on this relationship, and thereby synthesize the existing findings. Individuals alter their behavior to optimize their social image under the given framing.

Keywords: Social interactions, scopic regime, online trading, disposition effect.

JEL Classification: D14; G11; G23; G24.

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1 Introduction

Increasing overlap between social media and financial markets has led to the emergence of new business models in recent years. Several online brokerage services combine the services of online brokerage with features of social networks and allow individuals to manage their portfolios and exchange capital market related information. On so-called *social trading platforms*, investors can share their trading decisions in large networks and at the same time observe the trading strategies of other users. Gemayel and Preda (2017, 2018) label this state of permanent reciprocal observation and scrutiny a “scopic regime”, based on the concept introduced by Knorr Cetina (2003).

Previous literature suggests that investors alter their trading behavior when engaging in such a transparent trading environment. In his seminal work on the topic, Heimer (2016) argues that strategic efforts of investors in a social environment increase their disposition effect in order to convey a positive self-image. The disposition effect refers to the tendency of investors to sell winners too soon while holding losers too long. In line with the social transmission theory by Han et al. (2019), Heimer (2016) argues that “traders value the option to recount victories and seek to report positively about themselves”. In contrast, when having a losing position in one’s portfolio investors do not only have to admit to themselves that the investment decision was wrong, but also to their peers. As a consequence, Heimer (2016) argues that “financial peer effects—like the disposition effect—asymmetrically relate to gains and losses.” Complementing these findings, Pelster and Hofmann (2018) argue that investors have an increased urge to manage their social image and self-image once they become *signal providers* in an online trading network. The authors show that (unprofessional) financial advisors providing peer-to-peer advice increase their disposition effect even more (see also Glaser and Risius, 2018). These findings are underlined by the experimental study of Hermann et al. (2017) who find that especially pro-social inexperienced investors display a higher disposition effect when trading on behalf of others.¹

However, these findings are not undisputed. For example, Gemayel and Preda (2018) argue that the state of constant observation and scrutiny erodes the disposition effect as individuals become more self-conscious of their actions and limit their losses to avoid tarnishing their public trading record. Similarly, Lukas et al. (2017) argue that the increased transparency of investors trading in a way that is visible to the public reduces the disposition effect in social trading. The authors argue that the cognitive unease arising from public display of poor current performance outweighs the unease of realizing losses.

This paper proposes and tests the following hypothesis to reconcile the conflicting results: Each brokerage service utilizes a unique design for its website. The organization of information may be different across brokerage services, different information may be highlighted, or different colors may be used to highlight

¹Related, Rau (2015) shows that the disposition effect is higher in team decisions (see also Cici, 2012).

information. As people tend to react to a particular choice in different ways depending on how the choice is presented (Tversky and Kahneman, 1981), the partly contradicting evidence between the different archival studies may be explained by a different framing of the information of the brokerage services. Therefore, we experimentally study how the framing of social interactions drives the influence that social interactions exert on investors' trading behavior.

Our results indicate that investors change their behavior in a social environment according to the framing of social comparisons. Specifically, we show that a simple manipulation of rankings introduced to allow for peer comparisons that does not affect payoffs is sufficient to significantly influence investors' disposition effect. In our treatment condition, investors may improve their ranking position by selling winners immediately and holding losers. As a result, we observe individuals to pursue this strategy in our treatment condition.

Our results have strong practical implications for providers of social platforms. Specifically, providers of platforms may be able to increase rational behavior of their users by framing social comparisons on their platforms in a way that highlights users who act most rationally.

2 The disposition effect

Under the disposition effect, investors tend to be reluctant to close losing positions (Weber and Camerer, 1998; Odean, 1998), which is consistent with Kahneman and Tversky's Prospect Theory. Prospect Theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) studies decision-making under risk and assumes that individuals evaluate outcomes relative to a reference point. In the context of investment decisions, a security's purchase price can be seen as such a reference point. Decisions are based on potential gains and losses instead of final outcomes. The resulting value function is assumed to be concave for gains (i.e., individuals exhibit risk-averse behavior) and convex for losses (i.e., individuals exhibit risk-seeking behavior) and steeper for losses than for gains. Accordingly, losses have greater value (i.e., emotional impact) than equivalent gains. In terms of the disposition effect, winnings are realized at the concave part of the value function. As a consequence, investors prefer to reduce a risky position to realize a certain gain. In contrast, losses shift investors to the convex part of the value function, thereby increasing their willingness to hold a losing position for longer, in hope of reducing the loss - often referred to as the *reflection effect*. Note that, although Prospect Theory is often recognized as an explanation for the disposition effect (see, e.g., Shefrin and Statman, 1985; Odean, 1998; Weber and Camerer, 1998; Grinblatt and Keloharju, 2001), other possible explanations include realization preferences (Barberis and Xiong, 2012; Ingersoll and Jin, 2013), cognitive dissonance (Chang et al., 2016), pseudo-rational behavior (Odean, 1998), adverse

selection (Linnainmaa, 2010) and mean-reverting beliefs (Odean, 1998). The disposition effect has been shown to be influenced by several factors such as investors’ age, gender, education, or the trading activity of an investor (Dhar and Zhu, 2006; Kumar and Lim, 2008; Goetzmann and Kumar, 2008; Deaves et al., 2009; Da Costa et al., 2013; Rau, 2014).

3 Hypothesis development

People tend to react to a particular choice in different ways depending on how the choice is presented (Tversky and Kahneman, 1981). Investors, for example, evaluate an investment decision differently when it is presented as a potential loss or as a potential gain. More precisely, people tend to avoid risk when a positive frame is presented but seek risk when a negative frame is presented. In fact, framing is not limited to financial decision making but has been shown to apply to a large number of decisions (Tversky and Kahneman, 1981). Interestingly, just simply variations, such as a different color used to present information, influences the decision maker. For example, the color red has been shown to induce a risk-taking behavior as it is automatically associated with losses (Gnambs et al., 2015; Bazley et al., 2017). Thus, the framing or design of any decision problem may significantly influence its outcome.

The organization of information across brokerage services is different, as each service designs its own trading platform. For example, different information may be highlighted, or different colors may be used to highlight information. Particularly, while some trading platforms prominently display current portfolio positions, and thereby highlight positions with paper gains and paper losses with different colors (Lukas et al., 2017), other platforms focus on realized gains and losses and, for example, prominently display statistics summarizing how many trades were closed at a gain and at a loss, respectively. Thus, if investors in a social environment are concerned with their self-image, their strategies to convey a positive image differs across these platforms. Specifically, while investors, who trade on a platform that prominently displays paper gains and paper losses, have a motive to quickly close losing positions in order to convey a positive picture (i.e., lower disposition effect), investors, who trade on a platform that prominently displays winning and losing realized positions, have a motive to close winning positions quickly and hold on to losing positions to avoid realizing their loss (i.e., higher disposition effect).

Thus, we argue that the partly contradicting evidence (higher disposition effect (Heimer, 2016; Pelster and Hofmann, 2018) vs. lower disposition effect (Gemayel and Preda, 2018; Lukas et al., 2017) in a social trading environment) can largely be explained by a different framing of the information of the brokerage services and test this hypothesis in an experimental setting.

4 Study design

We designed and set up a randomized controlled investment decision setting that aims to distinguish the effect of different framings on investors' disposition effect.² Essentially, we rely on the disposition effect experiment proposed by Weber and Camerer (1998).³ To generate a social setting and allow for peer comparisons, we added rankings to the baseline setting. Specifically, at three pre-determined points during the experiment (after rounds 5, 10, and 14), participants are provided with rankings that show their trading success in relation to two randomly selected peers. All three rankings are shown with respect to the same peers. Importantly, rankings do not have any implications for participants' payoffs and this fact is pointed out to participants.

To test our hypothesis, we alter the design of the rankings between the treatment and the control condition. In the control condition, participants are ranked with respect to the current value of their portfolio. Thus, the ranking incorporates investors' paper gains and paper losses. In the treatment condition, however, participants are ranked with respect to their fraction of winning trades, while still showing their portfolio value. The fraction of winning trades an investor realized is a very simple statistic that does not require any additional explanations—even for inexperienced investors. The fraction of winning trades denotes the percentage of successful realized trades, that is the number of trades closed at a price, which is higher than the entry price. Hence, the rankings in the treatment condition only incorporate realized transactions and ignore open positions.

The baseline experimental setting by Weber and Camerer (1998) exploits six different assets which can be traded over 14 periods. Asset prices follow distinct random processes and are not influenced by investment decisions of investors. The six stocks represent different stock types with different chances to increase their prices. The stock with the best expected performance has a 65% chance of a positive price change; the second best stock has a 55% chance of a positive price change; two neutral stocks have even probability of a positive or negative price change; the fifth stock has a 55% chance of a decrease in stock price; the stock with the worst expected performance has a 65% chance of a decrease in stock price. Participants are informed about the existence of different stocks and their characteristics, but do not get any information which stock possesses which characteristics. After the direction of stock price changes has been determined, a second stochastic process determines the magnitude of the price change. Both stochastic processes are independent. Price increases are measured in terms of absolute values and can be either 1, 3, or 5 Talers.

²This study is registered on the Open Science Framework (unique identifier: osf.io/4nrmx) and in the AEA RCT Registry (unique identifier: AEARCTR-0004304).

³The experimental design has been repeatedly used to study the disposition effect in more detail; see for example Rau (2014, 2015); Hermann et al. (2017), amongst others.

Participants will be informed about the two-stage pricing process before the experiment. Participants will receive information on the stock prices of four periods (-3, -2, -1, 0) before period 1 starts.⁴

Table 1 summarizes the different stock types and allocates the different stocks to their types. Figure 1 depicts the stocks' price movements.

Place Table 1 and Figure 1 about here

Participants will be given an endowment of 10,000 Talers.⁵ In periods 1 to 14 subjects will be given the possibility to buy or sell assets which were labeled with the word *shares*. Subjects do not have to invest their endowment and may not borrow money. The setup does not include any transaction costs for trading. Short sales will be prohibited. After period 14 the portfolios of subjects will be automatically liquidated. Their final payoff corresponds to the value of the liquidated portfolio plus the money they owned in period 14.

To evaluate whether subjects have a good understanding of the stock types, they have to guess the stock types after periods 7 and 14. Participants will receive 200 Talers for each correct guess.

After completing the trading exercise, participants had to complete three additional tasks to elicit their risk preferences (Eckel and Grossman, 2008; Gächter et al., 2007; Holt and Laury, 2002) and fill in a brief survey. Full experimental instructions can be found in the appendix (Section A).

The experiment was programmed in oTree (Chen et al., 2016). Six sessions were conducted with a total of 81 students in June 2019 at the BaER-Lab at Paderborn University. Subjects were recruited with ORSEE (Greiner, 2015). Sessions lasted, on average, 77 minutes, and subjects earned, on average, 14.01 Euros and a show-up fee of 2.50 Euros.

5 Results

We rely on two established measures from the literature to estimate the disposition effect.⁶ First, relying on the approach of Odean (1998) and Strahilevitz et al. (2011), we estimate the disposition effect based on the *Proportion of Gains Realized* (PGR) and the *Proportion of Losses Realized* (PLR). At the end of each round, we count the stocks that are sold at a profit (loss) as *Realized Gain* (*Realized Loss*) and the trades that are not closed at a price that is higher (lower) than the purchase price as a *Paper Gain* (*Paper*

⁴Data on trial rounds is not included in the analysis.

⁵In both conditions an exchange rate of 1,000 Taler = 1 Euro was applied.

⁶These measures have been repeatedly used in the literature on the disposition effect, see, e.g., Rau (2014, 2015); Hermann et al. (2017).

Loss). Formally:

$$PGR = \frac{\text{Realized Gains}}{\text{Realized Gains} + \text{Paper Gains}} \quad (1)$$

and

$$PLR = \frac{\text{Realized Losses}}{\text{Realized Losses} + \text{Paper Losses}}. \quad (2)$$

Then, the *Disposition Effect* (DE) is defined as the difference between these terms: $DE = PGR - PLR$. For each participant, we calculate the average disposition effect over the 14 trading rounds.

A participant who sells all stocks that are in-the-money at the end of a round and holds all stocks that are out-of-the money exhibits the maximum disposition effect of one. Conversely, a participant who only keeps positions that are in-the-money exhibits the minimum disposition effect of minus one. If the participant equally closes profitable and non-profitable positions, her disposition effect is zero.

Second, we follow Weber and Camerer (1998) and estimate the disposition effect based on the α -measure. The α -measure is based on the number of sells after a price increase (decrease) of the last period's stock price. Formally,

$$\alpha = \frac{S_+ - S_-}{S_+ + S_-}, \quad (3)$$

where S_+ and S_- denote the number of sells after an increase and decrease, respectively. For each participant, we calculate the average α -measure over the 14 trading rounds. A positive α -measure indicates that participants tend to sell more stocks after stock price increases.

Place Table 2 about here

Table 2 presents summary statistics of the PGR, PLR, DE, and α . Subjects in the treatment condition exhibit a higher PGR (0.178 vs. 0.120; Mann-Whitney-U test, $p = 0.018$; t -test, $p = 0.013$), a lower PLR (0.089 vs. 0.126; Mann-Whitney-U test, $p = 0.022$; t -test, $p = 0.016$), and, therefore, a higher disposition effect (0.088 vs. -0.006; Mann-Whitney-U test, $p < 0.001$; t -test, $p < 0.001$), compared to subjects in the control condition. The result holds for the α -measure which is also higher for subjects in the treatment condition (0.312 vs. 0.084; Mann-Whitney-U test, $p = 0.001$; t -test, $p < 0.001$).

Place Figure 2 about here

The comparison of the α -measure of our study with α -measures of previously published studies on the disposition effect yield interesting additional insights. Compared to our data, these numbers can be interpreted as baseline results from a setting without social interactions. For example, Rau (2015) reports an α -measure of .22 for single investors. Interestingly, the average α -measure of our control condition (social comparison based on open and realized positions) is lower than .22, while the average α -measure of

our treatment condition (social comparison based on realized positions) is higher than this mean. These observations are in line with Lukas et al. (2017), who report that the disposition effect decreases in a transparent social setting that highlights positions with paper gains and paper losses with different colors, and Pelster and Hofmann (2018), who report a higher disposition effects in a social setting that focuses on social comparisons based on realized transactions.

Figure 2 compares the CDFs of the PGR and PLR for subjects in the treatment and in the control condition. The figure illustrates that the differences in subjects disposition effect are driven by both, subject selling behavior of capital gains as well as their selling behavior of capital losses. In order to generate a large number of winning trades, subjects in the treatment condition sell winning stocks quicker. Moreover, in order not to impair their ranking statistic, they hold on to losing positions longer.

We document that our findings are not driven by difference between subjects in our treatment and control condition. Table 3 shows that in both conditions, participants had similar demographics (age and gender), stock market experience, and academic background in terms of a Finance-related major. Investors had a good understanding of the stock types in both conditions. The average guess scores of rounds 7 and 14 do not show significant differences (2.436 vs. 2.52; Mann-Whitney-U test, $p = 0.45$). Also, we do not observe significant differences in subjects' loss or risk aversion.⁷

Place Table 3 about here

Finally, we perform a multivariate analysis on the determinants of the disposition effect using ordinary least squares (OLS) regressions. We regress the disposition effect (α -measure) on a treatment condition dummy variable and a set of control variables. Results are reported in Table 4.

Place Table 4 about here

In models (1) to (3) of Table 4, we use the disposition effect as our dependent variable, while we use the α -measure in models (4) to (6). Columns (1) and (4) do not include additional control variables. In models (2) and (5), we control for participants demographic information and their stock market experience. Lastly, models (3) and (6) also control for participants risk preferences. Across all models, we observe a significantly positive coefficient on Treatment, indicating that participants in the treatment condition exhibit a significantly larger disposition effect (e.g., $\beta = 0.097$ in model (3)). Overall, these findings provide strong evidence in support of our hypothesis. Given the average disposition effect documented in our control condition and reported in previous studies on the disposition effect using the same experimental design (e.g., 0.00 in Rau, 2015), the economic effect is also highly meaningful.

⁷We exclude participants whose choices in the risk tasks are not consistent with transitivity.

6 Discussion

Investors alter their trading behavior when trading in a transparent environment in order to convey a positive self-image and look good compared to their peers. This paper shows that the framing of the social comparison determines how investor behavior is changed. Specifically, we show that a simple manipulation of rankings introduced to allow for peer comparisons that does not affect payoffs is sufficient to significantly influence investors' disposition effect. Rankings in our treatment condition can potentially be influenced by investors selling winners quickly while holding losers. As a result, subjects in our sample pursue exactly this strategy, even though the rankings also display information on investors' total portfolio value (the ranking criteria in the control condition).

Our results synthesize conflicting evidence from the literature that studies the implications of social comparisons on financial markets. In this literature, several studies (Heimer, 2016; Pelster and Hofmann, 2018; Glaser and Risius, 2018) provide empirical evidence that investors increase their disposition effect when trading under increased scrutiny of their peers, while others (Gemayel and Preda, 2018; Lukas et al., 2017) document that investors decrease their disposition effect in such a scopic regime. The crucial difference between these studies is the representation of the social comparison on the trading platforms. We show that this representation drives investor behaviors.

On a higher level, our paper also demonstrates that peer effects and social comparison have large effects on human behavior. As a results, our results have practical implications for social trading platforms: In order to “help” their customers make rational decisions, platform providers should present information and social comparisons in a way that promotes rational behavior by maximizing the social image of such behavior. Such a framing may have larger impact on investors than the attempt to educate them.

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A Experimental instructions

Dear study participant,

thank you for agreeing to participate in our experiment on decision making in financial markets. Below, you will be presented a detailed description of the following experimental setup. Please read these instructions to the experiment carefully.

In the experiment, you will receive an amount of 10,000 Talers of fictional money, which you can use for investment in stocks subsequently presented to you in fourteen investment rounds.

If you complete all investment rounds and fill in all questionnaires you will receive a performance-based compensation for your participation in the experiment. After completing the study, you will receive the account balance of your fictional money divided by 1,000 in real money. Thus, during the experiment you will earn Talers which are converted to Euros by the following exchange-rate:

$$1,000 \text{ Talers} = 1 \text{ Euro}$$

For example, if your fictional account balances at 10,000 Talers at the end of the study, you will receive 10 Euros in real money in addition to your show-up fee of 2.50 Euro.

Description of the experiment

The experiment consists of 14 periods. In every period you have the possibility to buy shares of the firms A, B, C, D, E, and F. Every share has a certain value in Talers in every period. You start the experiment with an endowment of 10,000 Talers.

Performance of shares

The shares A-F will change in prices at the beginning of each of the 14 periods, i.e., in the subsequent period there will be no share which will have the same price as in the previous period. The share-price changes have been randomly predetermined before the experiment started. That is, all price changes of all shares are completely independent of all your buying and selling decisions. The same is true for all buying and selling decisions of the other participants of the experiment. Each of the shares A-F is of a certain type. The share types differ regarding their probability of increasing (decreasing) in value at the beginning of the period. The distributions of the types are given in the table below. In the experiment there will be exactly one share (of the shares A-F) which follows type "+ +" and the same is true for one share of type "+", "-", and "- -". There will be two types (of the shares A-F) which follow type "o". All types are displayed in the below table.

Shares in the market	Type	Probability of price increase	Probability of price decrease
1	++	65%	35%
1	+	55%	45%
2	0	50%	50%
1	-	45%	55%
1	—	35%	65%

Example:

- Assume that share X is of type: "+ +"
- At the beginning of each period the probability of a price increase of X is: 65%
- At the beginning of each period the probability of a price decrease of X is: 35%

The share price is determined as follows:

1. At the beginning of each period a share either increases (decreases). The probability depends on the share's type (see table).
2. Furthermore, the magnitude of the price movement (increase/decrease) will be determined. The magnitude of the price movement can either be of 1, 3 or 5 Talers. Every magnitude (1, 3 or 5 Talers) can happen with the same probability. That is, every magnitude (1, 3 or 5 Talers) can happen with a probability of one-third. This is the same for every share, independent of its type.

Buying and selling actions of shares





In each of the 14 periods you have the possibility to buy and sell shares for your portfolio. You will find a screen shot below which depicts all of your decision possibilities in the course of the experiment.

Please decide which stocks you want to buy or sell.

Note that you can only sell shares, which you currently hold in your portfolio. Also note, that the amount you invest in new shares cannot exceed your current cash holdings.

Your current cash amount to **\$6216.00.**

Stock	A	B	C	D	E	F
Current Price	93	87	156	134	70	73
Shares owned	10	10	3	3	8	8

<div>Stock A:  <input checked="" type="radio"/> Buy <input type="radio"/> Sell <input type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="5"/> </div>	<div>Stock B:  <input type="radio"/> Buy <input checked="" type="radio"/> Sell <input type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="3"/> </div>
<div>Stock C: <input type="radio"/> Buy <input type="radio"/> Sell <input checked="" type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="0"/></div>	<div>Stock D: <input type="radio"/> Buy <input type="radio"/> Sell <input checked="" type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="0"/></div>
<div>Stock E: <input type="radio"/> Buy <input type="radio"/> Sell <input checked="" type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="0"/></div>	<div>Stock F: <input type="radio"/> Buy <input type="radio"/> Sell <input checked="" type="radio"/> None</div> <div>Number of shares I want to trade: <input type="text" value="0"/></div>

Possibilities of decisions in the experiment

In the upper part you will find the share price window, displaying shares A-F. The price changes of shares A-F will be displayed here. (not shown in the figure)

Below, the screen displays your current portfolio value, your endowment (cash), and your current portfolio.

- “Current cash” displays your endowment, your cash. If you decide to buy shares of a firm then you have to pay for each share its current price. The sum of your expenditures cannot exceed your actual endowment.
- The array “Current price” depicts the price which has to be paid in order to buy new shares. At the same time you would receive this price for each share sold. For example, in the screen shot share A has a price of 93 Talers.

- The array “Shares owned” displays the current number of shares owned. For example, in the screen shot, you currently own four shares of A.

The window at the bottom is the transaction window. Here, you can decide in each period whether you would like to buy/sell one or more shares of shares A-F. If you decide to buy shares of a firm then you have to pay for each share its current price. The sum of your expenditures cannot exceed your current cash.

Example:

- Share A’s current price in period 1 is 110 Talers. You decide to buy five shares of A.
- The expenditures for this transaction are given by: $5 * 110 \text{ Talers} = 550 \text{ Talers}$ and are immediately subtracted from your endowment

If you already own some shares at the beginning of a period, then you have the possibility to sell these shares. You will receive the current price of each share which is sold. Then the revenue is added to your current cash. Selling shares follows the same principles as buying shares. However, the numbers of sold shares cannot exceed the total number of shares owned.

Example:

- Share C’s current price in period 5 is 90 Talers. Assume, you own a total of four shares C, which you bought for 85 Talers in the previous round, and decide to sell 3 shares C.
- This will lead to a payoff of: $3 * 90 \text{ Talers} = 270 \text{ Talers}$. This amount will be directly credited to your current cash. Afterwards you will still own one share of C.

The experiment ends after 14 periods. Then you do not have the possibility to buy or sell shares. All shares that you own at this point in time are automatically liquidated. The resulting money amount will automatically be credited to your endowment.

Rankings

[Treatment condition]

After rounds 5, 10, and at the end of the experiment, you will be presented rankings, which show your success in the experiment compared to two randomly selected study participants in the room. In this ranking, participants will be ordered according to their percentage of successful (“winning”) trades.

To generate the ranking, you will be asked to enter a “screen name” at the beginning of the experiment. The screen name will not be saved together with your decision variables, but is only used for the rankings. You are completely free to choose any screen name you want.

In order to calculate your percentage of successful (“winning”) trades, the number of trades you closed at a price, which is higher than the price you paid to purchase the stock, will be counted and divided by the number of trades you initiated (the number of times you buy new shares of a stock).

Note that you have to sell your shares (at a higher price than you paid for the shares) in order for your trade to be successful. Thus, shares, which are currently in your portfolio, do not count towards your successful trades.

Example:

- Share C’s current price in period 5 is 90 Talers. Assume, you own a total of four shares C, which you bought for 85 Talers in the previous round, and decide to sell 3 shares C.
- This will count as a successful trade and increase your number of successful trades.
- Share D’s current price in period 5 is 60 Talers. Assume, you own a total of three shares D, which you bought for 59 Talers in the previous round.
- This will not count as a successful trade, because you did not sell any of the shares, yet. Thus, the transaction is not finalized, yet.

[Control condition]

After rounds 5, 10, and at the end of the experiment, you will be presented rankings, which show your success in the experiment compared to two randomly selected study participants in the room. In this ranking, participants will be ordered according to their total assets (their current cash + value of all stocks).

To generate the ranking, you will be asked to enter a “screen name” at the beginning of the experiment. The screen name will not be saved together with your decision variables, but is only used for the rankings. You are completely free to choose any screen name you want.

[Both conditions]

Important: In order to see the rankings screen, all participants in this session will have to complete the first 5, 10, and 14 rounds, respectively. Thus, you may see a waiting screen. Then, you will have to wait for the other participants in the room.

Additional tasks

During the main experiment, you have to submit guesses on the stock types. This happens after the end of period 7 and after the end of period 14. Here, you have to guess which stock A-F followed the types: “+ +”, “+”, “0”, “-” and “- -”. You will be credited 200 Talers to your endowment for every correct guess at the end of the main experiment.

After the main experiment ends, you have the possibility to earn additional money by carrying out three tasks. The instructions for the tasks are displayed on the computer screen, respectively.

Payoff

The total payoff you earn in the experiment is calculated as follows:

Total payoff = cash at the end of the experiment + value of the shares in your portfolio + earnings of your guesses + your earnings from the three additional tasks + your show-up fee.

Practice rounds

We will start the experiment with 3 practice rounds of investments (the main experiment), which allows you to get accustomed to making the decisions and to get a feeling for the six different stocks. After the practice rounds, we will reset your endowment to 10,000 Talers and then start the experiment. Thus, any gains or losses during the practice rounds will not affect your payoff.

Additional Task 1: Eckel and Grossman-task

In this part you have to choose one of 9 lotteries which you prefer most. After your decision the computer will perform your selected lottery. Both payoffs arise with a probability of 50%. At the end of the experiment you will be informed of the outcome of the draw.

Place Table A.1 here

Additional Task 2: Gächter et al. (2007)

For this part, you receive an endowment of 70 cents. In the following, you are faced with 10 lotteries. Assume that for each of the lotteries a fair coin is thrown. The coin can either land on “heads” or “tail”. To answer each of the 10 questions you will have to choose “accept” or “reject” for taking part in the respective lottery. After you submit your decision, the computer will randomly draw one of the lotteries. If you reject this specific lottery, you will receive the endowment after the experiment. If you accept the randomly chosen lottery, the computer will flip a coin and the outcome of this coin toss will be added to your endowment. At the end of the experiment you will be informed of the randomly selected lottery and the outcome of the draw.

Place Table A.2 here

Additional Task 3: Holt and Laury (2002)

Below you are presented a set of lottery choices. For each of the ten lottery choices you can choose between lottery A and B. Please note that – while the payoffs for both lotteries remain the same across all ten lotteries – the probabilities between the lotteries vary. After you submit your decisions the computer will randomly draw one of the lotteries. Then, the computer will randomly decide the outcome of the chosen lottery. At the end of the experiment you will be informed of the outcome of the draw.

Place Table A.3 here

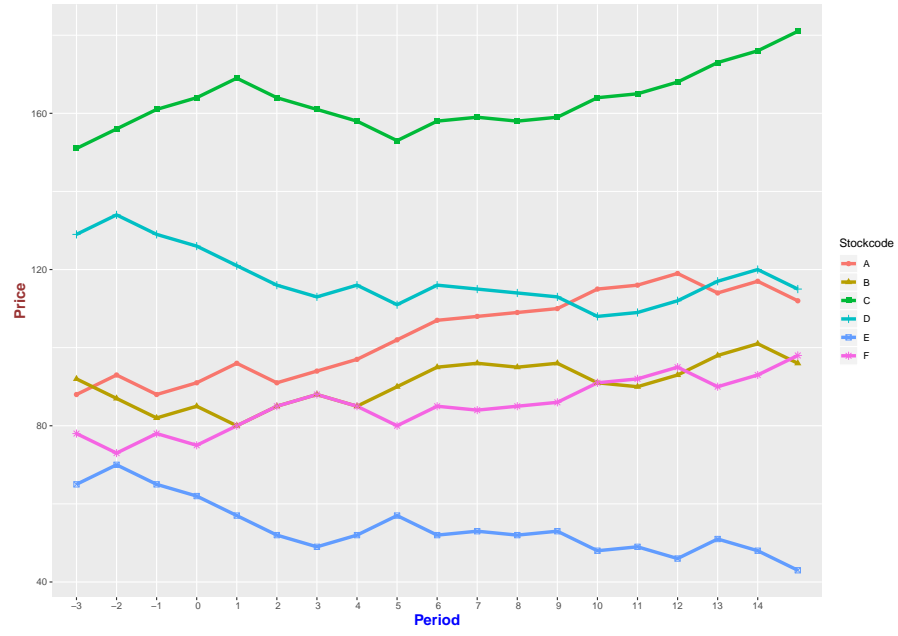


Figure 1: Price movements of stocks A to F over time

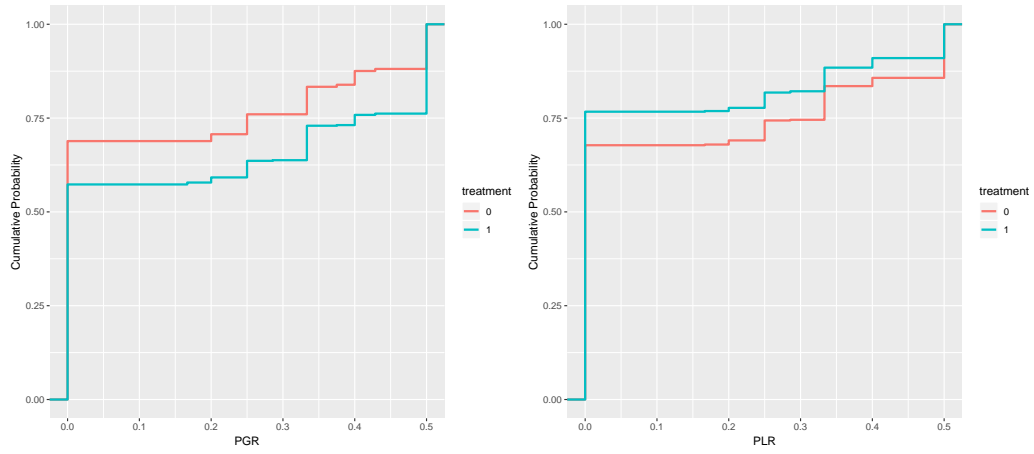


Figure 2: CDFs of control and treatment conditions' PGR/PLR

Stock	Type	Probability of price increase	Probability of price decrease
B	++	65%	35%
F	+	55%	45%
A, C	o	50%	50%
E	-	45%	55%
D	—	35%	65%

Table 1: Overview of the stock types with their probabilities of price increases and decreases

Condition	PGR		PLR		DE		α -measure		N
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Control	0.120	0.087	0.126	0.075	-0.006	0.066	0.084	0.276	39
Treatment	0.178	0.113	0.089	0.059	0.088	0.104	0.312	0.309	42
Avg.	0.150	0.105	0.107	0.069	0.043	0.099	0.202	0.313	81
Mann-Whitney-U test (p -value)	0.018		0.022		<0.001		0.001		
t -test (p -value)	0.013		0.016		<0.001		<0.001		

Table 2: Overview of participants' trading behaviors

Variable	Both conditions	Condition						<i>t</i> -test
		Control condition			Treatment condition			<i>p</i> -value
		Mean	SD	N	Mean	SD	N	
Female	0.65	0.615	0.49	39	0.69	0.47	42	0.484
Age	22.82	22.69	3.01	39	22.92	3.35	42	0.740
Experience	1.99	2.05	2.04	39	1.93	1.39	42	0.751
Finance	0.47	0.46	0.51	39	0.48	0.51	42	0.897
Guess	2.48	2.44	1.50	39	2.52	1.51	42	0.449
Loss Aversion (Gächter et al., 2007)	2.48	2.51	1.06	32	2.44	0.82	35	0.911
Risk Aversion (Eckel and Grossman, 2008)	0.43	0.39	0.86	39	0.58	0.93	42	0.366
Risk Aversion (Holt and Laury, 2002)	0.53	0.54	0.39	33	0.53	0.52	34	0.976

Table 3: Summary statistics of condition variables

Female is a dummy variable that takes a value of one for female participants, zero otherwise; *Age* denotes participants age in years; *Experience* denotes investors stock market experience, elicited with a scale from 1 (no experience) to 10 (high experience); *Finance* is a dummy variable that takes a value of one for participants with a Finance-related major, zero otherwise; *Guess* denotes the number of correct guesses from the stock type guesses of rounds 7 and 14; *Loss Aversion* (Gächter et al., 2007) denotes the result of the Gächter-Johnson-Herrmann-task; *Risk Aversion* (Eckel and Grossman, 2008) denotes the result of the Eckel and Grossman-task; *Risk Aversion* (Holt and Laury, 2002) denotes the result of the Holt and Laury-task. Participants whose choices in the risk tasks are not consistent with transitivity are excluded from the summary statistics. The *t*-test reports results from equality tests of non-treated versus treated participants.

	Disposition Effect			α -measure		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.095 (0.020)	0.095 (0.020)	0.097 (0.023)	0.228 (0.065)	0.225 (0.066)	0.249 (0.076)
Female		0.008 (0.024)	0.017 (0.028)		0.091 (0.079)	0.125 (0.094)
Age		-0.003 (0.003)	-0.003 (0.004)		-0.006 (0.011)	-0.008 (0.012)
Experience		0.001 (0.007)	-0.002 (0.008)		0.013 (0.022)	0.012 (0.025)
Finance		-0.016 (0.020)	-0.023 (0.023)		-0.047 (0.067)	-0.025 (0.077)
Loss Aversion (Gächter et al., 2007)			0.003 (0.013)			-0.003 (0.044)
Risk Aversion (Eckel and Grossman, 2008)			-0.018 (0.015)			-0.019 (0.049)
Constant	-0.006 (0.014)	0.057 (0.080)	0.071 (0.105)	0.084 (0.047)	0.168 (0.267)	0.161 (0.353)
Observations	81	81	67	81	81	67
Adjusted R ²	0.220	0.195	0.186	0.123	0.104	0.095

Table 4: OLS regressions on DE and α -measure

In models (1) to (3), the dependent variable is participants' disposition effect; in models (4) to (6), the dependent variables is participants' α -measure. *Treatment* is a dummy variable that takes a value of one for participants of the treatment condition, zero otherwise; *Female* is a dummy variable that takes a value of one for female participants, zero otherwise; *Age* denotes participants age in years; *Experience* denotes investors stock market experience, elicited with a scale from 1 (no experience) to 10 (high experience); *Finance* is a dummy variable that takes a value of one for participants with a Finance-related major, zero otherwise; *Loss Aversion* (Gächter et al., 2007) denotes the result of the Gächter-Johnson-Herrmann-task; *Risk Aversion* (Eckel and Grossman, 2008) denotes the result of the Eckel and Grossman-task. Participants whose choices in the risk tasks are not consistent with transitivity are excluded from models (3) and (6). Standard errors are reported in parentheses.

Lottery	Expected value of the lottery	Payoff A probability 50%	Payoff B probability 50%	Please choose your preferred lottery	Range of constant relative risk aversion if choosing this lottery ^a
1	€2.00	€2.00	€2.00	○	$1.37 \leq r \leq \infty$
2	€2.08	€2.56	€1.59	○	$0.97 < r \leq 1.37$
3	€2.26	€3.28	€1.24	○	$0.68 < r \leq 0.97$
4	€2.46	€4.00	€0.92	○	$0.41 < r \leq 0.68$
5	€2.55	€4.35	€0.74	○	$0.15 < r \leq 0.41$
6	€2.58	€4.59	€0.57	○	$-0.15 < r \leq 0.15$
7	€2.57	€4.65	€0.48	○	$-0.49 < r \leq -0.15$
8	€2.55	€4.67	€0.42	○	$-0.95 < r \leq -0.49$
9	€2.45	€4.68	€0.22	○	$-\infty \leq r \leq -0.95$

^a Column was not shown. A power utility function of the form $U(x) = \frac{x^{1-r}}{1-r}$ is assumed (Eckel and Grossman, 2008).

Table A.1: Eckel and Grossman-task

Lottery		Accept	Reject	Range of loss aversion
				coefficient (λ) if switching to reject in this row ^a
1	If the coin turns up heads, then you lose 12 cents; if the coin turns up tails, you win 60 cents	()	()	$5.00 \leq \lambda \leq \infty$
2	If the coin turns up heads, then you lose 15 cents; if the coin turns up tails, you win 60 cents	()	()	$4.00 \leq \lambda \leq 5.00$
3	If the coin turns up heads, then you lose 20 cents; if the coin turns up tails, you win 60 cents	()	()	$3.00 \leq \lambda \leq 4.00$
4	If the coin turns up heads, then you lose 25 cents; if the coin turns up tails, you win 60 cents	()	()	$2.40 \leq \lambda \leq 3.00$
5	If the coin turns up heads, then you lose 30 cents; if the coin turns up tails, you win 60 cents	()	()	$2.00 \leq \lambda \leq 2.40$
6	If the coin turns up heads, then you lose 35 cents; if the coin turns up tails, you win 60 cents	()	()	$1.71 \leq \lambda \leq 2.00$
7	If the coin turns up heads, then you lose 40 cents; if the coin turns up tails, you win 60 cents	()	()	$1.50 \leq \lambda \leq 1.71$
8	If the coin turns up heads, then you lose 50 cents; if the coin turns up tails, you win 60 cents	()	()	$1.20 \leq \lambda \leq 1.50$
9	If the coin turns up heads, then you lose 60 cents; if the coin turns up tails, you win 60 cents	()	()	$1.00 \leq \lambda \leq 1.20$
10	If the coin turns up heads, then you lose 70 cents; if the coin turns up tails, you win 60 cents	()	()	$0.86 \leq \lambda \leq 1.00$

^a Column was not shown. As in Gächter et al. (2007), equal curvature parameters in the gain and the loss domain are assumed for deriving λ .

Table A.2: Gächter-Johnson-Herrmann-task

Lottery	Please choose one of the following		Range of relative risk aversion for $U(x) = \frac{x^{1-r}}{1-r}$ ^a
	Lottery A	Lottery B	
1	€4 (10% chance) / €3.20 (90% chance)	€7.70 (10% chance) / €0.20 (90% chance)	$r < -0.95$
2	€4 (20% chance) / €3.20 (80% chance)	€7.70 (20% chance) / €0.20 (80% chance)	$-0.95 < r < -0.49$
3	€4 (30% chance) / €3.20 (70% chance)	€7.70 (30% chance) / €0.20 (70% chance)	$-0.49 < r < -0.15$
4	€4 (40% chance) / €3.20 (60% chance)	€7.70 (40% chance) / €0.20 (60% chance)	$-0.15 < r < 0.15$
5	€4 (50% chance) / €3.20 (50% chance)	€7.70 (50% chance) / €0.20 (50% chance)	$0.15 < r < 0.41$
6	€4 (60% chance) / €3.20 (40% chance)	€7.70 (60% chance) / €0.20 (40% chance)	$0.41 < r < 0.68$
7	€4 (70% chance) / €3.20 (30% chance)	€7.70 (70% chance) / €0.20 (30% chance)	$0.68 < r < 0.97$
8	€4 (80% chance) / €3.20 (20% chance)	€7.70 (80% chance) / €0.20 (20% chance)	$0.97 < r < 1.37$
9	€4 (90% chance) / €3.20 (10% chance)	€7.70 (90% chance) / €0.20 (10% chance)	$1.37 < r$

^a Column was not shown. Ranges of relative risk aversion are as in Holt and Laury (2002).

Table A.3: Conducted Holt and Laury-task