Center for European, Governance and Economic Development Research
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Discussion Papers

Number 332 – December 2017

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ISSN: 1439-2305

The Disposition Effect when Deciding on Behalf of Others

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December 2017

Abstract

The disposition effect is a well-established phenomenon which describes the behavior of investors that are more willing to sell capital gains than capital losses. In this article we present experimental evidence on a situation where an investor decides on behalf of another person. In our setting, trading effort should only be affected by investors' intrinsic motivation, as trading actions only influence the profits of a matched person. In a control treatment, trades directly influence investors' profits. Overall, we find that trading on behalf of others increases disposition effects. In this treatment, we find that the effect is caused by inexperienced investors, characterized by a greater concern for others. Thus, trading for others results in an emotional burden for these investors, which leads to weak trading performance.

Keywords: Disposition effect, experiment, decisions on behalf of others, social value orientation, loss aversion.

JEL Codes: C91, D14, D81, G41

1 Introduction

The disposition effect is a trading pattern characterized by investors that are reluctant to sell capital losses and realize capital gains early (Shefrin and Statman, 1985). The phenomenon is empirically well-documented for private investors (Odean, 1998; Frazzini, 2006), students (e.g., Weber and Camerer, 1998; Chui, 2001; Weber and Welfens, 2007), professional traders (Shapira and Venezia, 2001; Garvey and Murphey, 2004; Dhar and Zhu, 2006), and team investors (Rau, 2015). Indeed, the disposition effect is not only widespread it is also detrimental for investors (Odean, 1998).

Due to this importance a better understanding of the influencing factors of this phenomenon is crucial. There is evidence that disposition effects occur as a result of a combination of reference-dependent behavior (Kahneman and Tversky, 1979; Shefrin and Statman, 1985) and reference-dependent emotions (Summers and Duxbury, 2012). It follows from Prospect Theory (Kahneman and Tversky, 1979) and reference-point formation (Baucells et al., 2011) that loss-averse investors might have problems with realizing capital losses (Barberis and Xiong, 2012). Genesove and Mayer (2001) report empirical evidence that loss aversion positively correlates with disposition effects.[1] Summers and Duxbury (2012) reveal that such a behavior is amplified by reference-dependent emotions. That is, investors keep capital losses to avoid the feeling of regret when realizing that they invested in a disadvantageous stock. By contrast, if stocks exceed the purchase price, risk-averse investors quickly realize them (Shefrin and Statman, 1985). In this case, Summers and Duxbury (2012) find that rejoicing additionally stimulates the realization of capital gains. Overall, it turns out that disposition effects in particular occur as a result of self-control problems (Shefrin and Statman, 1985).

Laboratory experiments are appropriate instruments to test how institutional interventions can help to overcome self-control problems. There is evidence that automatic stop-loss orders (Weber and Camerer, 1998; Fischbacher et al., 2017) or the salient presentation of purchase prices (Frydman and Rangel, 2014) can attenuate the emergence of disposition effects. Another form of intervention which might impact disposition effects is 'trading on behalf of others.' The analysis of social trading is of importance, as private investors frequently delegate their decisions to professional traders (Garvey and Murphy, 2004). There is evidence that private investors with a low financial literacy are more likely to rely on family and friends (Van Rooij et al., 2011). The increasing popularity of delegated private investment choices is

[1] Experimental evidence (Gneezy and Potters, 2003; Fellner and Sutter, 2009) also supports the idea that myopic loss aversion matters in investment decisions, i.e., more information and more flexibility result in lower risk-taking behavior of investors.

demonstrated by the popularity of stock investment clubs or 'social-trading networks' such as 'etoro' (see http://www.etoro.com). The etoro platform allows investors to copy the trades of other traders, which can be seen as a form of delegated investment decision-making.

Empirical evidence suggests that professional traders who trade on behalf of others are less susceptible to causing disposition effects (Shapira and Venezia, 2001; Dhar and Zhu, 2006). However, there is a lack of knowledge regarding what the underlying forces are. The effects are also unclear when private investors are involved. An explanation for Shapira and Venezia's (2001) results might be that the trading experience of professional traders leads to improved trading performance (Ackert and Church, 2001; Da Costa Jr. et al., 2013). However, a couple of behavioral effects matter, such as, for instance, the perceived degree of loss aversion (Kahneman and Tversky, 1979), emotional responses (Shefrin and Statman, 1985; Summers and Duxbury, 2012) or reputational effects (Heimer, 2016; Pelster and Hofmann, 2017). Another factor is an investor's perceived social concern for her client. There is evidence that social distance to the decision target is an important determinant for investment behavior when deciding on behalf of others (Motinari and Rancan, 2013) and can be detrimental in social trading (Hershfield and Kramer, 2017). This emphasizes the disposition effects, if private investors trade with their friends' money. A related case is s by Rau (2015), who finds that responsibility for trading increases the disposition effects in teams.

Our study experimentally builds on the idea that social concerns for others are detrimental for investors' performance in social trading. We study the impact of subjects' social value orientation (prosocial type vs. individualistic type) on the emergence of disposition effects when deciding for others. Our experiments also control for additional factors which might affect disposition effects, such as loss aversion and trade experience. Recent findings of Andersson et al. (2014) suggest that deciding for others lowers loss aversion when choosing between lotteries in a price-list design. We test whether a different degree of perceived loss aversion in social trading affects disposition effects. Importantly, in our experiment we isolate the effects caused by monetary incentives or reputational concerns. Investors are matched to an anonymous client and the decision-makers' payment does not depend on their trading performance. Our setup minimizes reputational concerns as decision targets do not select the investors and are not informed of their performance before the experiment is finished. To analyze the effect of trading on behalf of others, we conduct two treatments based on the design of Weber and Camerer (1998). In the main treatment called '*Responsibility*,' each subject is randomly matched with an anonymous other subject. All participants repeatedly take investment deci-

sions on behalf of others and know that their profits depend only on the performance of another participant who is also trading on their behalf.[2] Our control treatment ('*Individual*') is an exact replication of Weber and Camerer (1998), i.e., investors trade only for their own benefits.

The results reveal that disposition effects are significantly higher in the *Responsibility* treatment. Furthermore, our findings show that the treatment effect can be entirely explained by differences in investors' social value orientation. It turns out that inexperienced investors, characterized by a prosocial attitude face self-control problems when taking decisions for others. The data show that this group exhibits a significantly higher disposition effect in social trading as compared to the case when trading for own benefits. By contrast, no treatment effect can be observed for individualists. The results add interesting new insights into the behavior of private traders who trade on behalf of their friends or are part of investment clubs.

2 Hypotheses

In this section we derive our hypotheses. Experimental evidence of team investment decisions demonstrate that payoff externalities enhance self-control problems, if trading also affects the payoff of a matched partner. Rau (2015) shows that teams of two investors are reluctant to sell capital losses. Empirical evidence of a social-trading platform suggests that reputational effects induce higher disposition effects for traders who are followed by others (Pelster and Hofmann, 2017). In our *Responsibility* treatment, where subjects *only* trade for the benefit of another matched person, we expect that prosocial investors should be affected by this condition. The reason is that these traders have a low perceived social distance to the decision target (Montinari and Rancan, 2013) and therefore should have increased problems in regulating their emotions (Hershfield and Kramer, 2017). Hence, we expect that disposition effects are more pronounced when traders are responsible for other persons.

Hypothesis 1:

(a) Disposition effects are higher in the Responsibility *treatment than in the control treatment.*

(b) In Responsibility*, disposition effects will be stimulated by investors with a prosocial attitude.*

[2] To study trading on behalf of others in isolation, we followed Andersson et al. (2014) and refrained from situations where a monetary conflict of interest exists between the investor and the stakeholder.

Empirical and experimental evidence reveals that individual loss aversion stimulates disposition effects (Genesove and Mayer, 2001; Rau, 2014). Thus, we expect that subjects with a higher degree of loss aversion realize fewer capital losses and exhibit more pronounced disposition effects. Andersson et al. (2014) report that subjects behave less loss-averse when deciding for others. In *Responsibility,* investors trade on behalf of others. As trades do not affect their income, they should have a different perception of losses in this case. Hence, the correlation between loss aversion and disposition effects should be less pronounced in *Responsibility.*

Hypothesis 2:

(a) Individual loss aversion is positively correlated with disposition effects.

(b) In Responsibility*, the impact of loss aversion on disposition effects is attenuated.*

3 Experimental design

In this section we describe our experimental design. First, the experiment design of Weber and Camerer (1998) is introduced. Second, we discuss the differences between our treatments *Individual* and *Responsibility*. Third, we provide a brief overview of the additional experimental tasks implemented to measure individual preferences (risk aversion, loss aversion, and social value orientation) and personal characteristics.

3.1 The framework of Weber and Camerer

In the experimental framework of Weber and Camerer (1998) six different labeled assets A, B, C, D, E, and F can be traded over 14 periods. The asset prices are predetermined for all periods and follow a distinct random process. Participants' trading actions do not influence stock prices. The price sequences of all 14 periods are pre-determined before the experiment starts. The stocks are classified in different types according to their chances of a price increase. More precisely, exactly one stock follows a good/very good quality (labeled: +, ++), one stock follows a poor/very poor quality (labeled: −, − −), and two stocks fluctuated around the starting price with a 50% probability of rising prices (labeled: 0). Subjects were told about the existence of the types and their characteristics, but received no information on the allocation of the labels. Our experiment applied the same stocks (A to F), the same allocation of the stock types, and the same price sequences as in Weber and Camerer (1998). In each period, prices are determined in two stages: 1. determination of the direction of price movement; 2. determination of the change in the price magnitude. The two stages are explained in detail in the following sections.

3.1.1 Stage 1: Determination of the Direction of Price Movement

In the first stage the computer determines whether an asset will increase/decrease in value. The probability of a price increase/decrease depends on the assets' stock types. Weber and Camerer's (1998) random process allocates fixed probabilities of stock price increases/decreases for each type of each quality. This feature allows the predetermination of the sequence of the price changes. A random process determines whether a stock will increase or decrease in value. This depends on the underlying probabilities of price increases of the stock types. Although the participants are familiarized with the probabilities of a price increase or decrease, they do not know which probability belongs to which stock. Nevertheless, the participants can guess by counting and comparing the number of price increases in the previous periods. Table 1 presents the underlying allocation of the stocks (A to F) to the types. Our experiment follows Weber and Camerer (1998) and adopts their design.

Table 1: Stock characteristics

Stock		**Probability of price change**	
Name	Type	Increase	Decrease
A	+	55%	45%
B	–	45%	55%
C	– –	35%	65%
D; E	0	50%	50%
F	++	65%	35%

Note: Overview of the stock types and their probabilities of price increases and decreases (stock names are not shown to the participants).

3.1.2 Stage 2: Determination of the Price Magnitude

After the random process determines whether an asset will increase, the computer randomly determines the magnitude of the price change in the second stage. It can be either 1, 3 or 5 Talers. All outcomes occur with a probability of one third. The probability of a stock price increase is not correlated with the magnitude of the price change and the expected value of a price change for a randomly-chosen stock is zero (Weber and Camerer, 1998).[3] Weber and Camerer (1998) determined the price sequences of stocks according to this approach. They also computed the asset prices for four prior periods: -3, -2, -1, and 0. This information is pre-

[3] The framework easily allows the application of Bayesian Updating in each period. Bayesian subjects would repeatedly update their beliefs on the increase probability of all six shares, based on the actual observed price changes. Hence, investors might apply a simple heuristic of counting the number of times a stock increased to determine its type. The stock whose price has increased most often is most likely to be of the ++ type. The stock which had the second highest number of price increases has to be of type +, etc.

sented to subjects prior to the start of the experiment. The purpose is to give participants an initial idea of the stocks' characteristics. In this experiment we also present this information to subjects prior to the start of the experiment. Figure 1 illustrates the resulting stock movements of Weber Camerer (1998) in periods -3 to 14.

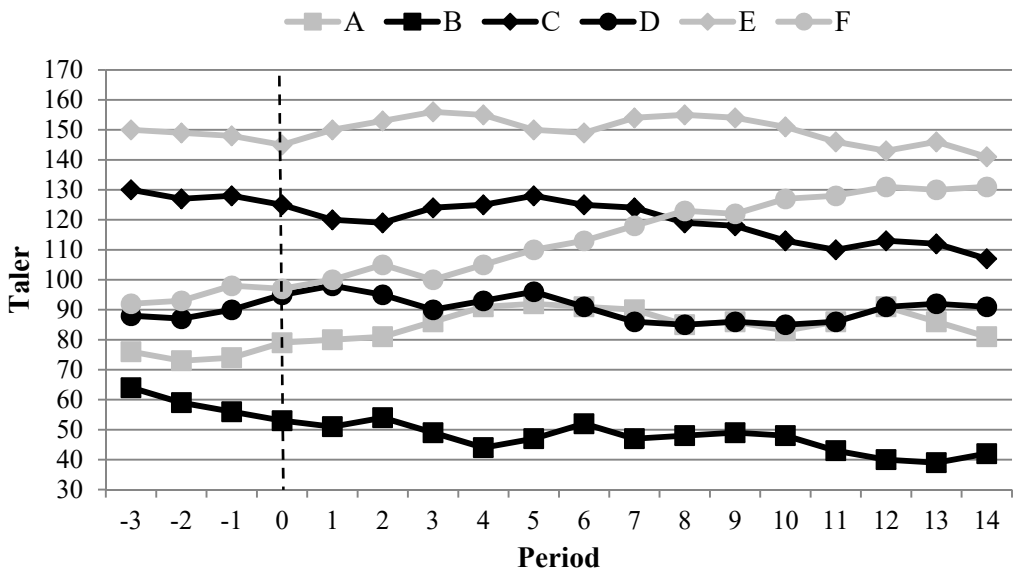


Figure 1: Price movements of stocks A to F over time.
Note: Dashed line marks the beginning of the trade period; Figure is not shown to the participants at the beginning of the experiment.

3.1.3 Elicitation of Guess Scores

In the experiment we follow Weber and Camerer (1998) to examine the possibility that subjects' disposition effects are caused by a misjudgment of the stock types. That is, after periods 7 and 14 subjects must guess the type of each of the six stocks. The estimates are used to derive delta (δ), a measure of fit between the best fit and a subject's guess of the stock type. The guesses of the six stocks are coded as follows: ++ = 2, + = 1, 0 = 0, − = -1, − − = -2. The coding corresponds to the rational estimate. Afterwards, the absolute value of the difference between a subject's guess and the rational estimate is calculated for each of the six stocks. The delta corresponds to the sum of the absolute differences of all six stocks. The δ measure ranges from 0 (best estimates) to 12 (worst estimates). For instance, if a subject guesses that the ++-type is stock 'F' then the subject's actual estimate equals the rational estimate. Thus, the difference is: 2−2 = 0. If the subject guesses that the 0-type is stock 'A' then the difference is: 1−0 = 1. It follows for the delta of this subject: δ = 0 + 1+ etc.

3.1.4 Measures of the Disposition Effect

When investors sell shares, the purchase prices are not always known. Hence, the paper reports two accounting principles to compute results: (i) Average Price; (ii) First-In-First-Out (FIFO).[4] The Average-Price approach (e.g., Odean, 1998) determines the purchase price as the weighted average of all purchase prices. Whereas, the FIFO measure identifies the purchase prices by assuming that investors sell the stocks in distinct orders. That is, it assumes that investors first sell the stocks which were bought first.

Furthermore, the analysis follows Odean (1998) to investigate the occurrence of disposition effects. Therefore, we determine the proportion of gains realized (PGR) and the proportion of losses realized (PLR). The PGR (PLR) is the number of realized gains (losses) divided by the total number of possible gains (losses) that could have been sold. In accordance with Odean (1998), it can be defined as follows:

$$Proportion\ of\ Gains\ Realized\ (PGR) = \frac{Realized\ Gains}{Realized\ Gains + Paper\ Gains} \tag{1}$$

$$Proportion\ of\ Losses\ Realized\ (PLR) = \frac{Realized\ Losses}{Realized\ Losses + Paper\ Losses} \tag{2}$$

We calculated the individual-level disposition effects (DE) for all participants as the difference between the PGR and PLR:

$$DE = PGR - PLR \tag{3}$$

The DE measure is restricted to a range between -1 and 1. Participants with DE = 1 (-1) realized all gains (losses) immediately, whereas they never realized losses (gains). For investors with DE = 0, PGR and PLR are equal.

We also compute disposition effects with the measure of Weber and Camerer (1998) to provide a robustness check for the DE measure. We refer to this measure as the 'alpha' measure. Alpha examines whether participants used last period's prices as reference points. More precisely, it is tested whether subjects prefer to sell stocks after price increases of the last period's price. The alpha measure is defined as:

[4] We also calculated LIFO (Last-In-First-Out) but results are not affected by using this accounting principle. Weber and Camerer (1998) and Rau (2015) also find no differences between these accounting principles.

$$\alpha = \frac{(S_+ - S_-)}{(S_+ + S_-)} \tag{4}$$

S_+ (S_-) represents the sum of sales realized after price increases (decreases). Alpha corresponds to the difference in sales after a price increase and a price decrease, normalized by the total number of sales. An alpha of 1 (-1) indicates that participants only sold after the price increased (decreased). If the alpha amounts to zero, the number of sells after price increases and price decreases is the same.

3.2 *Individual* versus *Responsibility* Treatment

In a between-subject design, we test for differences between the two treatments: *Individual* and *Responsibility*. *Individual* is identical to the experiment of Weber and Camerer (1998) as well as Rau (2015). It follows the framework described in section 3.1. A crucial difference applies to *Responsibility*, where participants decide on behalf of another participant from the respective experimental session. The experiment was programmed using z-Tree (Fischbacher, 2007). The data encompasses four sessions of *Responsibility* with a total of 85 subjects[5] and four sessions of *Individual* with a total of 85 subjects. In total, 170 participants took part in the experiment and were recruited with ORSEE (Greiner, 2015). The subject pool consisted of students from the University of [filled in case of publication] from various fields who earned €16.70 on average. The sessions lasted approximately 110 minutes.

3.2.1 Procedures of the Individual treatment

In *Individual* all participants received an endowment of 10,000 Talers. In both treatments we applied an exchange rate of 1,000 Taler = €1. In periods 1 to 13 (see Figure 1) subjects could buy or sell assets which were labeled with the neutral German word 'Anteile' (''shares"). Subjects did not necessarily have to invest any amount of their endowment. There were no transaction costs for trading actions and subjects were not allowed to make short sales, i.e., they could only sell stocks which they owned. In period 14 subjects' portfolios were automatically liquidated. Their final payoff corresponded to the value of the liquidated portfolio plus the money they owned in period 14. To evaluate whether subjects had a good understanding of the stock types, they had to guess the stock types after periods 7 and 14. Here, they received 200 Talers (€0.20) for each correct guess.

[5] Unfortunately, we had to remove one observation from our *Responsibility* scenario as this participant had taken part in a classroom experiment of the Weber and Camerer (1998) experiment, as part of a behavioral finance seminar. However, we did let this participant complete the experiment, and paid her and the trading partners according to their respective trading success.

3.2.2 Responsibility

In *Responsibility* almost everything was identical to *Individual*. However, one crucial difference was that a trader decided on behalf of someone else and her outcome of the trading experiment also depended on the decisions of someone else. To establish this treatment environment, all participants acted in the role of an investor and recipient. More precisely, subjects determined with their trading actions the payoff of a randomly matched recipient. At the same time, they received a payoff which depended on the trading performance of another randomly matched participant. Our matching procedure ruled out that two subjects could mutually generate their payoffs. We explicitly informed our subjects on this matching procedure which prevents participants from evolving any kind of reciprocal mental connection to their matched partner. At the beginning of the experiment every participant received a note containing a letter from the alphabet attached to the instructions. Participants made aware that the letter served as their experimental identity.[6] Afterwards, participants were told in the instructions that they had to decide for another participant in the experimental session and that their earnings from the experiment would depend on someone else. When the trading experiment started, participants received a screen message informing them of the letter of the participant which they would be deciding for. Moreover, they were shown another letter of the person who would be deciding for them. We informed participants in the decision sheet of each period that they would decide on behalf of the matched recipient. Therefore, we again mentioned that they would be making their decisions on behalf of this participant.

3.3 Additional experimental tasks

Besides the main trading experiment, we conducted further elicitation tasks. Before the trading experiment started, a computerized risk-aversion, loss-aversion and social value orientation elicitation task was conducted. Finally, after the trading experiment had been carried out, subjects' empathy, levels of perceived regret, and rejoice were elicited in a post-experimental questionnaire.

To elicit risk aversion, we carried out a modified version of the measure, introduced by Eckel and Grossman (EG; Eckel and Grossman, 2008). In the EG task participants chose a preferred lottery from a set of lotteries. The classical form of the EG, however, allows us to measure detailed distinctions exclusively for different levels of risk aversion. We therefore decided to

[6] Participants in *Individual* received a note containing a letter as well, in order to provide comparable framework conditions in both scenarios.

extend the classical EG task to gather additional information on whether participants were risk-neutral or risk-seeking.[7]

In a next step we elicited subjects' loss aversion through an incentivized multiple price list, introduced by Gächter et al. (GJH; Gächter et al., 2007) and used in several other studies, e.g., Dutcher et al. (2015) and Koudstaal et al. (2016).[8] Participants had to decide 10 times whether they wished to take part in a lottery or not. In all 10 lotteries, participants could face a loss with a chance of 50%, or receive a gain with a probability of 50%. The probabilities for a loss or gain as well as the amount of the gain are constant across all lotteries. However, the potential loss increases across the lotteries. The GJH task allows for a characterization of participants regarding their degree of loss-aversion, which is expressed by lambda (λ), a coefficient indicating loss-aversion (Gächter et al., 2007). The task was incentivized and each participant received an endowment of €0.70[9] at the beginning of the experiment. This endowment ensured that no participant had a negative payoff. To determine each participant's final payoff, a random lottery was drawn. If the random lottery was accepted by the participant, the respective lottery was performed and the outcome was added to the initial endowment. If the random lottery was rejected, the participant did not take part in the lottery and received the endowment.

To answer our question of whether investors' social-value orientation (SVO) impacts disposition effects when deciding on behalf of others, we elicited subjects' SVO with an incentivized measure according to Murphy et al. (2011) (see appendix A.3). In the SVO Slider Measure, participants had to decide in six different decision situations ('sliders') which allocation of tokens they would like to choose from a given set of combinations. Each combination included an amount of tokens which would be received by the deciding participant and an associated amount of tokens which would be received by a randomly matched participant.[10] Every participant received a payment from the *SVO Slider Measure*. Participants were informed that the decision in one of the six sliders would be relevant for their payment. In this case, in a random draw half of the participants ('deciders') received the monetary amount according to

[7] For detailed illustration of the conducted task and possible outcomes of the lotteries, please refer to appendix A.1. To determine the payoff, the chosen lottery was performed and the outcome was paid to the participant at the end of the experimental session.
[8] The modified design of the GJH-task is adapted from Rau (2014) and can be found in appendix A.2.
[9] The monetary amounts used in the tasks were chosen according to an average wage approach: average wage per time unit multiplied by the expected time units to carry out the task.
[10] The randomly assigned participant was not the same as in the stock trading experiment.

their own decisions and the other half received a monetary amount depending on the decision of the randomly matched 'decider.'

In addition, we measured subjects' empathy using a 16-item questionnaire answered on a 5-point Likert scale.[11] The empathy measure is based on the Interpersonal Reactivity Index (IRI), introduced by Davis (1983). We used a modified version according to Paulus (2012). To calculate the empathy score of a participant the 5-point Likert scale was transformed into numbers. If participants chose the response 'never' the corresponding number was 1, if they chose 'rarely' the number was 2, and so on. The empathy score is the sum of the 16 items minus the numbers from items 3, 6, 8, and 13.

4 Results

In this section, we start with descriptive statistics on trading behavior in our two treatments. Afterwards, we apply non-parametric and parametric-test methods to validate our hypotheses. All reported tests are based on two-sided p-values, if not otherwise specified.

4.1 Trading Behavior

Table 1 presents the descriptive statistics of subjects' trading behavior in the *Individual* and *Responsibility* treatment. The third column displays the aggregate data. The table presents bought stocks and sold capital gains/losses which denote the average number of traded stocks. Whereas the variables processed gains, gain trades, and loss trades focus on the average number of processed trades.

A conspicuous finding is that investors in both treatments sell a significantly higher average number of capital gains than capital losses (Wilcoxon matched pairs tests, $p < 0.001$; both treatments). A similar pattern can be found when focusing on gain and loss trades. This is a first indication that disposition effects obviously occur in both treatments. We find that in *Responsibility* not statistically significant more stocks are bought and more capital gains and losses are sold than in *Individual.*

[11] The translation of the items is provided in appendix A.4.

Table 2: Descriptive statistics on trading behavior

	Individual **(n=85)**	***Responsibility*** **(n=85)**	**All data (n=170)**
Bought stocks	141.01 (94.30)	148.88 (80.97)	144.95 (87.72)
Sold capital gains	45.74 (50.62)	47.80 (47.31)	45.74 (50.62)
Sold capital losses	33.75 (36.34)	35.93 (40.87)	34.84 (38.57)
Processed trades	26.79 (12.29)	26.75 (11.75)	26.77 (11.99)
Gain trades	4.67 (3.91)	5.13 (3.79)	4.90 (3.85)
Loss trades	4.45 (3.77)	4.38 (3.43)	4.41 (3.60)

Note: Standard deviation in parenthesis.

4.2 Hypotheses tests

We turn to our main results. Figure 2 focuses on the disposition effects calculated with the method of Odean (1998). The figure depicts subjects' average Disposition Effects (DE), the Proportion of Gains Realized (PGR), and the Proportion of Losses Realized (PLR).

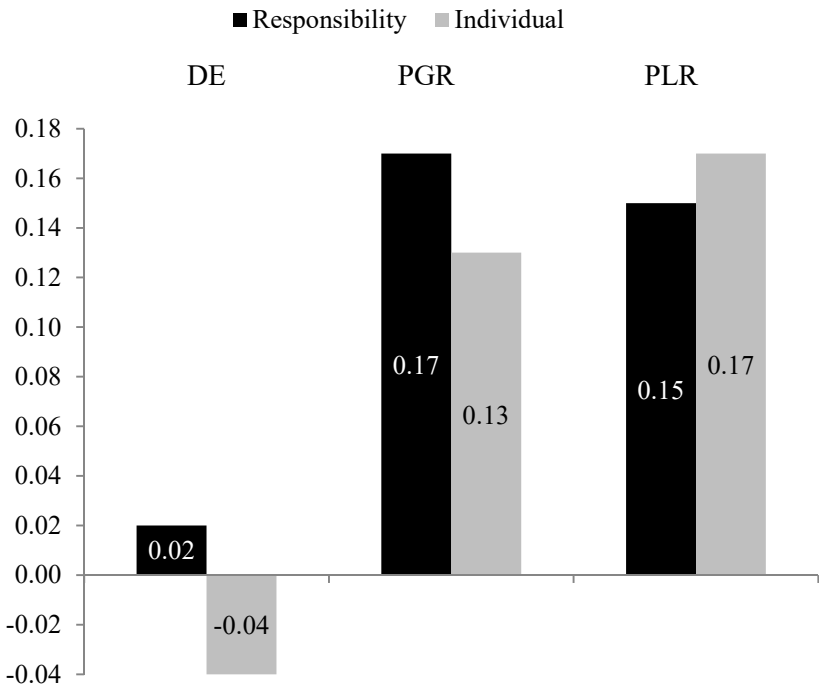


Figure 2: Disposition Effects (DE), Proportion of Gains Realized (PGR), and Proportion of Losses Realized (PLR) in the treatments *Responsibility* and *Individual*.

The data show that subjects exhibit higher disposition effects when deciding on behalf of others (0.02; SD: 0.25) than in the *Individual* treatment (-0.04; SD: 0.21) (Mann-Whitney test, $p = 0.067$). The results are in line with empirical evidence by Pelster and Hofmann (2017). Our data is also supported by the Alpha measure of Weber and Camerer (1998). Figure 3 compares the Cumulative Distribution Functions (CDF) of subjects' Alphas in our two treatments.

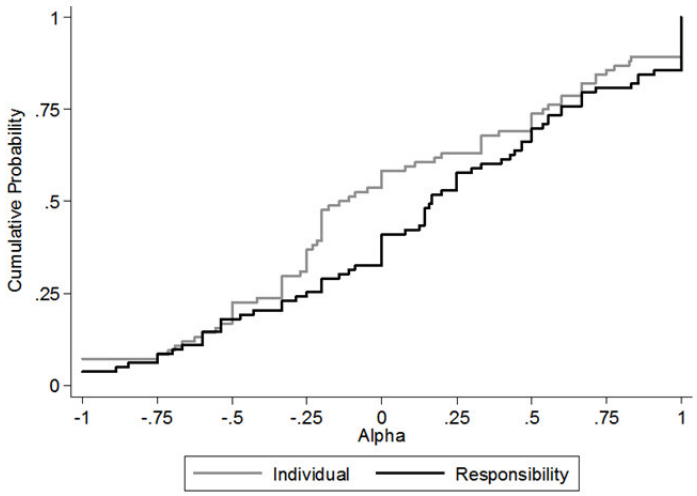


Figure 3: Alpha measure in our treatments.

The CDFs of subjects' Alphas are significantly different in the *Responsibility* treatment (0.17) than in the case when subjects trade for their own profits (0.03) (Kolmogorov-Smirnov test, $p = 0.034$). Hence, we find support for Hypothesis 1a.

Result 1: *Deciding on behalf of others leads to significantly higher disposition effects as compared to trading for own benefits.*

Next, we concentrate on the impact of traders' social-value orientation (SVO) and test whether a lower social distance to the decision target leads to an increase in problems with controlling their emotional states (Montinari and Rancan, 2013). Consequently, difficulties with self-control might arise (Hershfield and Kramer, 2017) which cause pronounced disposition effects (Rau, 2015). We turn to Hypothesis 1b and test whether prosocial traders (Prosocials) with a low level of perceived social distance exhibit more pronounced disposition effects than traders with a high level of perceived social distance (Individualists). Fenton-O'Creevy et al. (2011) point out that investors with low trading experience especially have problems in the regulation of emotions. Therefore, we distinguish between the SVO of less-experienced traders and more-experienced traders. Focusing on trading experience, it turns out that 54% of our

subjects stated that they had very low trading experience of 1. Therefore, we classify subjects with a trading experience of 1 (>1) as inexperienced (experienced).

Focusing on experienced traders, we do not find that social-value orientation statistically significantly determines the level of disposition effects in *Responsibility* (Pearson's correlation coefficient, $\rho = -0.223$; $p = 0.178$).[12] By contrast, we observe that the level of perceived social distance clearly matters for inexperienced traders. This finding is illustrated in Figure 4 which presents scatter plots of the correlation between subjects' SVO angle and the level of exhibited disposition effects. In the scatter plots data of the treatment *Responsibility* (left panel) and treatment *Individual* (right panel) is compared.

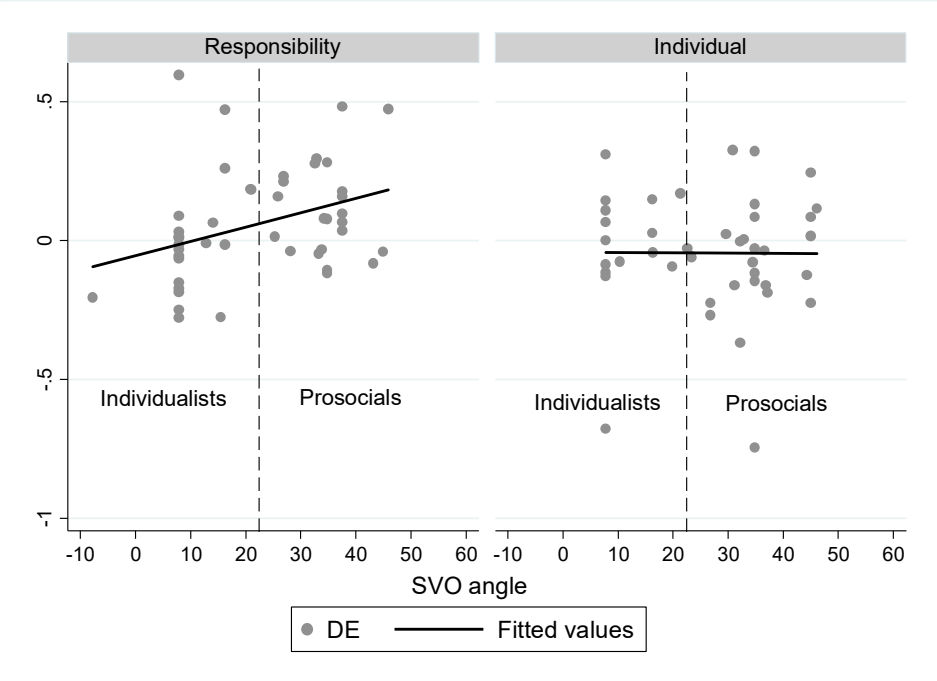


Figure 4: Scatter plots on the correlation of the SVO angle of inexperienced traders (trading experience = 1) and disposition effects in *Responsibility* (left panel) and *Individual* (right panel).
Note: Dashed line indicates the threshold of the SVO angle which divided individualistic (left) and prosocial (right) subjects (Murphy et al., 2011).

A conspicuous finding is that in *Responsibility* we find a significant positive correlation between subjects with a higher degree of social-value orientation (i.e., a higher SVO angle) and the level of exhibited disposition effects. We interpret these subjects in *Responsibility* as investors who perceive a lower level of social distance to the matched recipient. This pattern is confirmed by a significant Pearson's correlation coefficient ($\rho = 0.346$; $p = 0.019$). Hence,

[12] A similar finding can be observed in *Individual* (Pearson's correlation coefficient, $\rho = -0.005$; $p = 0.978$).

inexperienced prosocial subjects exhibit higher disposition effects than inexperienced individualists (Mann-Whitney test, p = 0.038) when trading on behalf of others.

By contrast, in the right panel, it can be seen that this correlation does not exist when inexperienced investors trade for their own interests in treatment *Individual*. That is, the Pearson correlation coefficient is not statistically significant (ρ = -0.006; p = 0.970). When investors trade for their own benefits, the disposition effects of prosocial and individualistic subjects do not differ statistically significantly (Mann-Whitney test, p = 0.282). Importantly, for individualistic investors we do not find a significant correlation between SVO angle and DE, neither in the *Responsibility* treatment (ρ = -0.223; p = 0.178), nor in the *Individual* treatment (ρ = -0.005; p = 0.978). Thus, we find support for Hypothesis 1b when focusing on inexperienced traders. Whereas the hypothesis is rejected for subjects who had trading experience.

Result 2a: *When inexperienced investors are responsible for other people, prosocial types exhibit significantly higher disposition effects than individualistic types.*

Result 2b: *When inexperienced investors are responsible for other people, the level of investors' social-value orientation determines the level of disposition effects.*

Finally, we analyze whether deciding on behalf of others impacts the degree of perceived loss aversion which might affect the occurrence of disposition effects. Focusing on the aggregate data, we generally find that disposition effects are stimulated by loss aversion. That is, we observe a positive correlation between loss aversion and DE (Pearson's correlation test, ρ = 0.201; p = 0.014). This is in line with Genesove and Mayer (2001) and Rau (2014) and confirms Hypothesis 2a.

To test the effects of trading on behalf of others, we focus on a disaggregate analysis. If we focus separately on the *Individual* treatment, it becomes obvious that the relation between loss aversion and the level of the disposition effect also holds (Pearson's correlation test, ρ = 0.201; p = 0.014). By contrast, the relation becomes insignificant in the *Responsibility* treatment (Pearson's correlation, ρ = 0.172; p = 0.137). Thus, the effect of loss aversion is attenuated when subjects decide on behalf of others. This supports the findings of Andersson et al. (2014) and is in line with Hypothesis 2b.

Result 3a: *Loss aversion stimulates the occurrence of disposition effects.*

Result 3b: *The relation between loss aversion and disposition effects is attenuated in the Responsibility treatment.*

The results show that though deciding on behalf of others attenuates the impact of loss aversion on disposition effects, traders do not achieve an improved performance in this setting. However, our analysis of the impact of social-value orientation provides an answer: As it turns out, prosocial investors who perceive a lower distance to their matched person exhibit particularly high disposition effects.

4.3 Regression Analyses

To provide an in-depth analysis of disposition effects, we estimate OLS regressions on DE, PGR, and PLR realized by subjects. Table 3 illustrates the regression estimates for the three dependent variables DE (models 1–2), PGR (models 2–3), and PLR (models 4–5). In regressions (1), (3), and (5) we include a treatment dummy (*Responsibility*) and subjects' preference parameters (loss aversion and risk aversion). Models (2), (4), and (6) additionally control for the impact of trading experience and social value orientation, i.e., we include interaction terms of subjects' trade experience with the treatment dummies (*Responsibility* and *Individual*) and subjects' social-value orientation (prosocial and individualistic). Furthermore, we control for subjects' gender, the stated emotions (regret/rejoice), the level of empathy, and their math grade.

Model (1) confirms Result 1, i.e., the general treatment effect: when participants decide on behalf of another participant, the disposition effect is significantly more pronounced than in the *Individual* treatment. Results show that the coefficient of *Responsibility* is positive and significant. The highly significant positive coefficient of *Loss Aversion* demonstrates that disposition effects are more pronounced for loss-averse traders. This confirms the result of Rau (2014). Model (2) reveals that loss aversion is still a significant determinant of DE if we control for other variables. Moreover, the female gender is a factor that increases DE significantly; which also confirms the results of Genesove and Mayer (2001) and Rau (2014). However, risk preferences, emotions, empathy, and math grades do not statistically significantly affect DE.

Table 3: OLS regressions on DE, PGR and PLR

	DE		PGR		PLR	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.155 ***	0.137	0.019	0.014	0.245 ***	0.154
Responsibility	0.076 **	-	0.053 **	-	-0.023	-
Trade experience[a]	-0.015	-	-0.018	-	-0.001	-
Prosocial[b]	-0.021	-	0.022	-	0.045	-
Individual x LOWexperience x Individualistic	-	Reference	-	Reference	-	Reference
Individual x LOWexperience x Prosocial	-	0.002	-	-0.014	-	-0.016
Responsibility x LOWexperience x Individualistic	-	0.065	-	0.042	-	-0.023
Responsibility x LOWexperience x Prosocial		0.173 **		0.155 **		-0.018
Individual x HIGHexperience x Individualistic		0.047		-0.005		-0.053
Individual x HIGHexperience x Prosocial		-0.018		0.025		0.042
Responsibility x HIGHexperience x Individualistic		0.081		0.045		-0.037
Responsibility x HIGHexperience x Prosocial	-	-0.001	-	0.027	-	0.032
Loss aversion (lambda)[c]	0.068 ***	0.053 ***	0.019	0.020	-0.049 ***	-0.033 **
Risk aversion (CRRA)[d]	-0.002	-0.014	-0.016	-0.019	-0.013	-0.005
Female	-	0.078 *	-	0.009	-	-0.070 **
Pride[e]	-	-0.001	-	0.006	-	0.007
Regret[f]	-	0.011	-	0.002	-	-0.009
Empathy[g]	-	-0.003	-	0.000	-	0.003
Math grade (1–15)[h]	-	0.004	-	0.004	-	0.000
R^2	0.070	0.136	0.050	0.098	0.072	0.141
Observations	149	149	149	149	149	149

Note: Twenty-one participants show inconsistent choices (switching back and forth between accepting and rejecting lotteries) in the GJH task and are therefore omitted for the regression estimates. Level of significance: *** p <0.01, ** p <0.05, * p <0.10

a. According to a specific question with possible values ranging from 0 (no experience) and 10 (highly experienced). B. According to an incentivized Murphy task, possible values ranging from -16.26° to 61.39°. c. According to an incentivized GJH task, possible values ranging from 0.68 to 5.50. d. According to a modified and incentivized EG task, possible values ranging from -1.60 to 1.81. e. According to a specific question with possible values ranging from 0 (not proud at all) and 10 (very proud). f. According to a specific question with possible values ranging from 0 (no regret) and 10 (very much regret). g. According to the IRI based Saarbrücker personality questionnaire, possible values ranging from 12 to 60. h. Possible values ranging from 0 to 15; 15 is the best grade.

To better understand the driving forces of the treatment differences in disposition effects, we focus on subjects' selling behavior in more detail. In this respect, we run separate regressions on the Proportion of Gains Realized (PGR) (models 3–4) and on the Proportion of Losses Realized (PLR) (models 5–6). It becomes obvious from models (3) and (5) that the treatment effect is mainly caused by an increased PGR in the *Responsibility* treatment. More precisely, in the *Responsibility* treatment we find more PGR. This is highlighted by Model (3) which focuses on subjects' PGR as dependent variable. Here, we find that the coefficient of *Responsibility* is positive and significant. Thus, when participants decide on behalf of another person, they reveal a more pronounced tendency to realize capital gains, compared to the situation where they trade for their own benefit. Furthermore, the degree of loss aversion is a key driver of PLR (see Model (5)). That is, a higher degree of loss aversion leads to a smaller PLR.

If we ignore subjects' social value orientation (models (1), (3), (5)), it becomes obvious that the variable *Trade experience* is generally not significant. Nevertheless, trading experience is a crucial factor for the emergence of disposition effects. This becomes obvious if we incorporate subjects' social-value orientation in our analyses. In Model (2), the significant positive interaction term of *Responsibility x LOWexperience x Prosocial* Model demonstrates that the treatment effect is caused by inexperienced subjects characterized by a prosocial social-value orientation who exhibit more pronounced disposition effects when trading for others. Wald tests comparing the coefficients from Model (2), reveal that prosocial traders with low trading experience in the *Responsibility* treatment additionally show a higher DE than high experienced prosocial ($p = 0.088$) and low experienced individualistic ($p = 0.049$) investors in the *Responsibility* treatment. This again confirms our main findings of results 1a and 1b. Turning to Model (4), it becomes clear that this behavior is induced by an increased realization of capital gains by this group of investors, when trading affects a decision target. More precisely, we find a positive significant effect of the interaction of *Responsibility x LOWexperience x Prosocial* on PGR. Model (4) indicates that the elevated DE for the prosocial investors with low trading experience in the *Responsibility* treatment is caused by the greater proportion of divested paper gains in this group.

Result 4: *The driving force of the treatment effect can be attributed to a significantly higher proportion of gains realized in the responsibility treatment. This behavior is initiated by inexperienced traders with prosocial value orientation.*

4.4 The role of investor motivation

A further possible explanation for the treatment effect could be differences in investors' motivation to trade, as their performance in *Responsibility* will be revealed to a matched partner (Pelster and Hofmann, 2017). We assume that trader motivation could be reflected by the number of trades processed, as trading is associated with effort. Besides the first indications from Table 2 regarding the trading volume, we provide a more detailed overview of the trading volume. Table 4 focuses on the data of the *Responsibility* treatment. It illustrates the trading volume of traders with high and low trading experience in the *Responsibility* treatment.

Table 4: Trading volume in different subsamples of the *Responsibility* treatment

	Trading volume[a]		p-value[b]	**Trading volume**[a] **low experienced**		p-value[b]
	High experienced	*Low experienced*		*Individualistic*	*Prosocial*	
Total trades	226.3	241.0	0.822	211.9	270.1	0.244
	(122.1)	(161.3)		(153.5)	(167.0)	
Buying volume	146.1	151.3	0.774	135.4	167.2	0. 203
	(69.6)	(90.2)		(87.1)	(92.4)	
Selling (gains) volume	45.7	49.6	0.778	31.8	67.4	0. 083
	(39.7)	(53.3)		(29.2)	(65.5)	
Selling (losses) volume	33.6	37.9	0.727	44.1	31.8	0.930
	(34.5)	(45.9)		(60.7)	(23.3)	

Note: Standard deviation in parentheses.
a Number of traded shares in all stocks.
b According to a Wilcoxon signed-rank test.

The table compares trading volume based on subjects' trading experience (columns 1–3) and based on the SVO of subjects with low trading experience (columns 4–5).

It becomes obvious that the total trading volume does not differ between the different levels of trading experience. A conspicuous finding can be observed when focusing on the trading volume of subjects based on their SVO. That is, prosocial inexperienced subjects even process a weakly significant higher trading volume of capital gains (67.4) compared to individualistic subjects (31.8) (Wilcoxon signed-rank test, $p = 0.083$). This underlines the finding that the significant treatment effect of the PGR only arises because prosocial traders with low trading experience process a higher trading volume. Hence, we find that this group is even more motivated when trading on behalf of others.

A further method to control for investors' motivation is to focus on their understanding of the stock types. In the Weber and Camerer (1998) framework subjects know that each of the six stocks follows a distinct type, i.e., stocks with a better rating are more likely to increase. As a consequence, subjects have the possibility to identify a stock's type by counting the number of stock price increases/decreases. Our idea is that, if an investor is motivated to achieve a good performance, she should therefore try to find out the stocks' characteristics. Subjects' evaluations of the stock types are measured by the guess score we elicited in the experiment. It turns out that Mann-Whitney tests focusing on the guess scores after period 7 and 14 find no significant differences between experienced and inexperienced investors (period 7: $p = 0.371$; period 14: $p = 0.210$). The same holds when comparing guess scores between prosocial vs. individualistic subjects (period 7: $p = 0.761$; period 14: $p = 0.316$). This adds further support against the idea that inexperienced prosocial investors exhibit more pronounced disposition effects because of a lack of motivation.

Result 5: *The higher disposition effect of inexperienced traders with prosocial value orientation in* Responsibility *is not driven by less motivation of these individuals.*

5 Conclusion

This paper analyzes the disposition effect of investors who decide on behalf of other subjects. A special interest was whether prosocial investors in this case exhibit more pronounced disposition effects, as they feel closer to the other person. We explored this research question experimentally, as this enables us to tackle possible obstacles which are hard to isolate in the field. First, the setup allows us to focus on the pure effects of intrinsic motivation from the investors' side. That is, the experimental framework of a *Responsibility* treatment avoids by design that extrinsic motives from the investors' side could be a reason for behavioral changes in social trading. More precisely, as investors in *Responsibility* are not paid based on their trading performance, it can be ruled out that they strive for a (high) own monetary benefit. Moreover, we exogenously match the decision targets to the investors. Thus, it cannot be that investors have extrinsic motives to attract traders that are following them. The latter can play an important role in online social trading platforms where 'leading' traders receive bonuses for each trader who decides to copy their trades (Pelster and Hofmann, 2017).

The results support our hypothesis, i.e., we observe stronger disposition effects when investors' trading decisions affect the payoff of other subjects. More concrete, inexperienced traders with a prosocial attitude more readily sell capital gains when taking decisions for others. By contrast, no treatment effect can be found for individualistic subjects and decision-makers

with a high degree of trading experience. We find that deciding on behalf of others abolishes the correlation of individual loss aversion and the disposition effect (Andersson et al., 2014) which, however, has no effect on treatment differences. We focus on a couple of robustness checks on investors' trading volume and their understanding of the stock types to proxy their motivation when deciding for others. However, we find no evidence that inexperienced investors in the *Responsibility* treatment could be less motivated. That is, no differences in trading volume or between the precision of guess scores can be found for the different trader types.

The results are exciting, as we can conclude that even intrinsic motives (which may be shared by friends) are sufficient to cause pronounced disposition effects when deciding for others. It is noteworthy that social distance in our anonymous design should rather be less distinctive. Hence, it is likely that the effects are more pronounced when investors decide for their friends and therefore know the other person. Our findings have practical implications for everyday trading. That is, private investors who consider delegating their investment decisions to friends should be cautious, as prosocial investors with a low degree of trading experience exhibit pronounced disposition effects. Referring to the findings of Shapira and Venezia (2001), we conclude that professional traders exhibit lower disposition effects for two reasons: First, they are characterized by a higher degree of trading experience. Second, we speculate that individualistic persons might self-select to a career as a trader. Further research could add treatments testing whether a monetary incentive for traders deciding on behalf of others affects the results, and in which direction. It could be expected that the monetary incentive does not affect the (inexperienced prosocial) traders and they further perform worse.

6 References

Ackert, L. F., Church, B. K. (2001). The effects of subject pool and design experience on rationality in experimental asset markets. *Journal of Psychology and Financial Markets*, 2(1), 6-28..

Andersson, O. Holm, H.J., Tyran, J.R., Wengström, E. (2014). Deciding for others reduces loss aversion. *Management Science* 62(1): 29–36.

Barberis, N. and Xiong, W. (2012). Realization Utility. *Journal of Financial Economics* 104(2): 251–271.

Baucells, M., Weber, M., Welfens, F. (2011). Reference-point formation and updating. *Management Science*, 57(3), 506-519.

Chui, P. M. W. (2001). An experimental study of the disposition effect: Evidence from Macau. *Journal of Psychology and Financial Markets* 2(4): 215–221.

Da Costa, N., Goulart, M., Cupertino, C., Macedo, J., Da Silva, S. (2013). The disposition effect and investor experience. *Journal of Banking and Finance* 37(5): 1669–1675.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology* 44: 113– 126.

Dhar, R., Zhu, N. (2006). Up close and personal: Investor sophistication and the disposition effect. *Management Science*, 52(5), 726-740.

Dutcher, E. G., Balafoutas, L., Lindner, F., Ryvkin, D., Sutter, M. (2015). Strive to be first or avoid being last: An experiment on relative performance incentives. *Games and Economic Behavior* 94: 39–56.

Eckel, C.C., Grossman, P.J. (2008). Forecasting risk attitudes: an experimental study using actual and forecast gamble choices. *Journal Economic Behavior & Organization 68*(1): 1–17.

Fellner, G., Sutter, M. (2009). Causes, consequences, and cures of myopic loss aversion–An experimental investigation. *Economic Journal*, 119(537), 900-916.

Fenton-O'Creevy, M., Soane, E., Nicholson, N., Willman, P. (2011). Thinking, feeling and deciding: The influence of emotions on the decision making and performance of traders. *Journal of Organizational Behavior* 32(8): 1044–1061.

Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics 10*(2): 171–178.

Fischbacher, U., Hoffmann, G., Schudy, S. (2017). The causal effect of stop-loss and take-gain orders on the disposition effect. *Review of Financial Studies* 30(6): 2110–2129.

Frazzini, A. (2006). The disposition effect and underreaction to news. *Journal of Finance* 61(4): 2017–2046.

Frydman, C., Rangel, A. (2014). Debiasing the disposition effect by reducing the saliency of information about a stock's purchase price. *Journal of Economic Behavior & Organization 107*: 541–552.

Gächter, S.E., Johnson, J., Herrmann, A. (2007). Individual-level loss aversion in riskless and risky choices. *CeDEx Discussion Paper 2007-02. University of Nottingham*.

Garvey, R., Murphy, A. (2004). Are Professional Traders Too Slow to Realize Their Losses? *Financial Analysts Journal* 60(4): 35–43.

Genesove, D., Mayer, C. (2001). Loss aversion and seller behavior: evidence from the housing market. *Quarterly Journal of Economics* 116(4): 1233–1260.

Gneezy, U., Kapteyn, A., Potters, J. (2003). Evaluation periods and asset prices in a market experiment. *Journal of Finance*, 58(2), 821-837.

Greiner, B. (2015). Subject pool recruitment procedures: organizing experiments with ORSEE. *Journal of the Economic Science Association*, 1(1), 114-125..

Heimer, R.Z. (2016). Peer Pressure: Social interaction and stock-market participation. *Review of Financial Studies* 29: 3177–3209.

Hershfield, H.E., Kramer, L.A. (2017). Examining the Effect of Social Distance on Financial Decision-Making. *Working Paper.*

Kahneman, D., Tversky, A. (1979). Prospect Theory: An analysis of decision under risk. *Econometrica* 47(2): 263–291.

Koudstaal, M., Sloof, R., van Praag, M. (2016). Risk, Uncertainty, and Entrepreneurship: Evidence from a Lab-in-the-Field Experiment. *Management Science* 62(10): 2897–2915.

Montinari, N., Rancan, M. (2013). Social preferences under risk: The role of social distance. *Jena Economic Research Papers* 62(10): 2897–2915.

Murphy, R.O., Ackermann, K.A., Handgraaf, J.J. (2011). Measuring Social Value Orientation. *Judgment and Decision Making* 6(8), 771–781.

Odean,T. (1998). Are investors reluctant to realize their losses? *Journal of Finance* 53: 1775–1798.

Paulus, C. (2012). The possibility of a general empathy score in the German version of the IRI? Retrieved from http://scidok.sulb.uni-saarland.de/volltexte/2012/4889/

Pelster, M., Hofman, A. (2017). About the Fear of Reputational Loss: Social Trading and the Disposition Effect. *Working Paper.*

Rau, H.A. (2014). The disposition effect and loss aversion: Do gender differences matter? *Economics Letters* 123(1): 33–36.

Rau, H.A. (2015). The disposition effect in team investment decisions: Experimental evidence. *Journal of Banking & Finance* 61: 272–282.

Shapira, Z., Venezia, I. (2001). Patterns of behavior of professionally managed and independent investors. *Journal of Banking Finance* 25(8): 1573–1587.

Shefrin,H., Statman,M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance* 40: 777–790.

Summers, B., Duxbury, D. (2012). Decision-dependent emotions and behavioral anomalies. *Organizational Behavior and Human Decision Processes* 118: 226–238.

Van Rooij, M., Lusardi, A., Alessie, R., (2011). Financial literacy and stock market participation. *Journal of Financial Economics* 101: 449–472.

Weber, M., Camerer, C. (1998). The disposition effect in securities trading: An experimental analysis. *Journal of Economic Behavior & Organization* 33: 167–184.

Weber, M., Welfens, F. (2007). An individual level analysis of the disposition effect : empirical and experimental evidence. *SFB 504 Discussion Paper No. 07-45.*

Appendix

A.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.

Table A.1: Conducted EG-task

Lottery	Expected value of the lottery[a]	Payoff A probability 50%	Payoff B probability 50%	Please choose your preferred lottery	Range of constant relative risk aversion if choosing this lottery[b]
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 shown in the modified version.

b 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).

A.2 Gächter et al. task

You receive an endowment of 70 cents for this part. In the following you are faced with 10 lotteries. Assume that for each of the 10 questions a coin is thrown. The coin can either land at 'heads' or 'tail.' To answer each of the 10 questions you will either have to choose 'accept' or 'reject' taking part in the respective lottery. After you submit your decisions 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.

Table A.2: Conducted GJH-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 cent; 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.

A.3 SVO slider measure

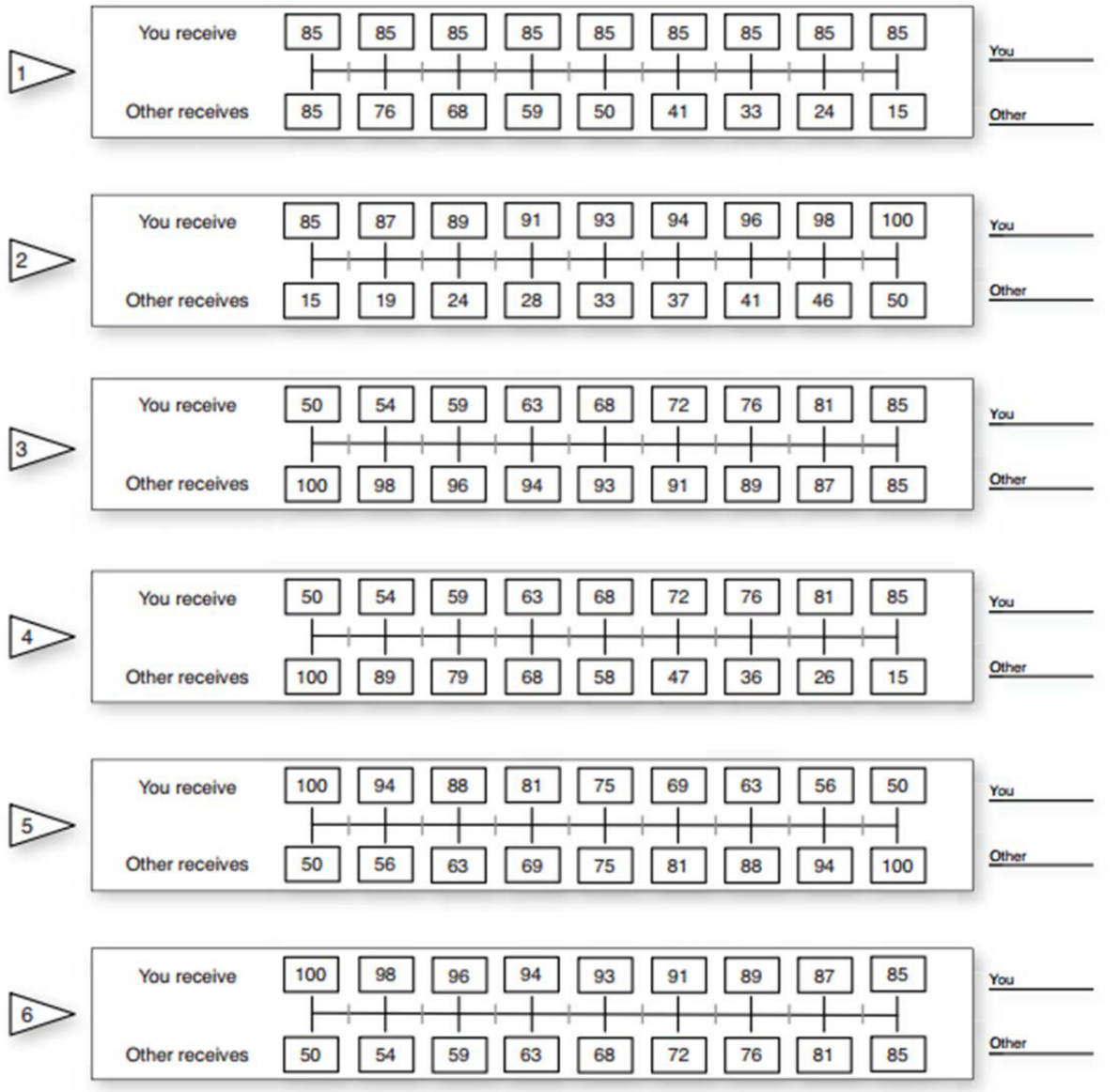


Figure A.3: SVO Sliders that were presented gradually to the participants. Values are by a conversion factor of 100 token = 2 €.

A.4 Questionnaire for measuring empathy

You will now read several statements which describe specific (generalized) human attitudes or reactions. All of them are associated with emotions. Please mark on the 5-point-scale to what extent they apply to you. Higher numbers indicate greater agreement. Perhaps you remember a specific incident for the specific statements. **There is no right or wrong.**

Answer scale:

	Never	Rarely	Sometimes	Frequently	Always
Statement # 1-16	○	○	○	○	○

Statements:

1. I often have tender, concerned feelings for people less fortunate than me. (EC)
2. I really get involved with the feelings of the characters in a novel. (FS)
3. In emergency situations, I feel apprehensive and ill-at-ease. (PD)
4. I try to look at everybody's side of a disagreement before I make a decision. (PT)
5. When I see someone being taken advantage of, I feel kind of protective toward them. (EC)
6. I sometimes feel helpless when I am in the middle of a very emotional situation. (PD)
7. After seeing a play or movie, I sometimes feel as though I were one of the characters. (FS)
8. Being in a tense emotional situation scares me. (PD)
9. I am often quite touched by things that I see happen. (EC)
10. I believe that there are two sides to every question and I try to look at them both. (PT)
11. I would describe myself as a pretty soft-hearted person. (EC)
12. When I watch a good movie, I can very easily put myself in the place of a leading character. (FS)
13. I tend to lose control during emergencies. (PD)
14. When I'm upset at someone, I usually try to 'put myself in his shoes' for a while. (PT)
15. When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me. (FS)
16. Before criticizing somebody, I try to imagine how I would feel if I were in their place. (PT)

A.5 Post-experimental questionnaire

Please answer the following questions. Afterwards we will give out the payments.

If you have owned stocks which have increased in value, how much joy did you feel? Pleas answer on a scale from 1-10 (where 1 = no joy; 10 = much joy).

( ) 1 …. ( ) 10

If you have owned stocks which have decreased in value, how much regret did you feel? Pleas answer on a scale from 1-10 (where 1 = no regret; 10 = much regret).

( ) 1 …. ( ) 10

What is your gender?

What was your math grade at school?

How do you assess your personal experience in the trading of stocks? Please answer on the following scale from 1–10 (where 1 = no experience in trading and 10 = very extensive experience in stock trading)

( ) 1 …. ( ) 10

Experimental Instructions: Responsibility treatment

[Not intended for publication; translation from German]

[Instructions in the control treatment are almost similar as in the Responsibiltiy treatment. The major differences are that the instructions do not start before the announcement of the exchange rate. Moreover, we also do not tell subjects that they trade for a matched person. Instead, we always inform them that their trading actions determine their payoffs.]

Welcome to this experiment about decision making. Please read these instructions to the experiment carefully.

At the beginning of the experiment, every participant will receive a slip of paper with a letter on it (e.g. 'B' or 'U). These letters are assigned randomly and the alphabetic order is not linked to the numbers of the cabins.

In the main part of the experiment you will decide for someone else. This other participant is randomly assigned to you by the computer and the person will remain anonymous during and after the experiment. The only information available to you is the randomly assigned letter. Furthermore, you are also assigned to another participant who decides for you.

Note: The participant who decides for you is not the same person as the person you are deciding for.

For the main experiment:

- Your decisions do not have any consequences for your payoff. However, your decisions have direct consequences for the payoff of the randomly assigned participant.
- Your payoff depends on the decisions of the randomly assigned participant. This participant decides for you and is not the participant you are deciding for.

Before the experiment starts, you are informed about the anonymous name (i.e., the letter) of the person for whom you take your decisions. Moreover, you are informed about the name (i.e., the letter) of the person who decides for you.

[Instructions of the control treatment only start at this paragraph]

During the experiment you will earn Talers which are converted to Euros by the following exchange-rate:

1,000 Talers = €1

At the end of the experiment, the assigned participant whose payoff depends on your decisions will receive your Taler earnings converted in € and you will receive the amount the other participant earned for you in Euros. You will be informed about the earnings of the assigned participant at the end of the experiment before you are paid.

After the experiment, please wait at your desk until we will ask you to come to get your payoff. The payment is anonymous. Thus you will not get information about payments of other participants or their assigned letter. Please notice that it is not allowed to talk during the experiment. If you will talk to other persons, the experiment will be aborted immediately. If you have a question, please raise your hand. We will come to your desk to answer it privately.

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 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 '0'. All types are displayed at 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%

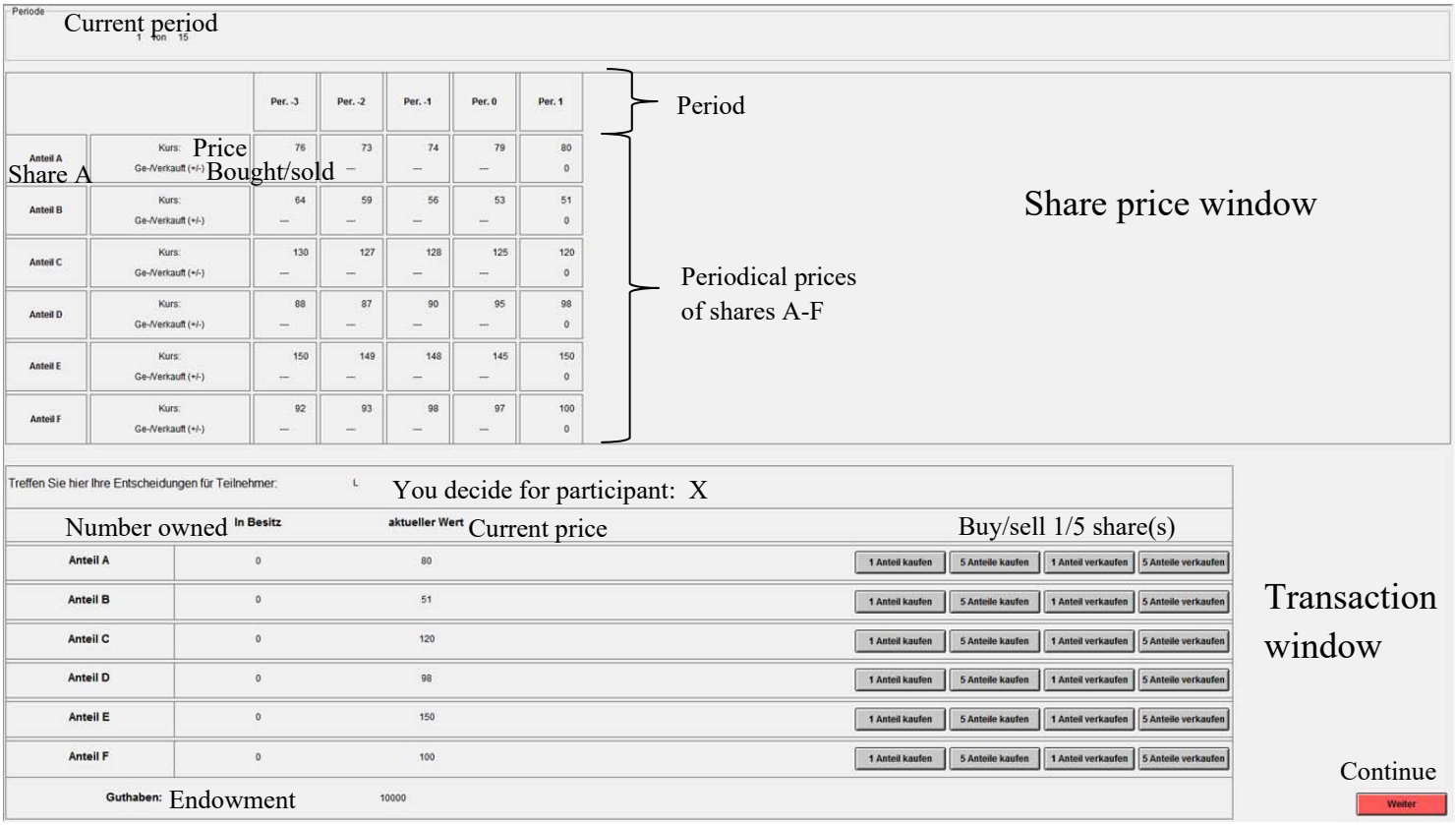
The share price is determined as follows:

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 the portfolio of the other participant. You will find a screen shot at the next page which depicts all of your decision possibilities in the course of the experiment. In the upper part you will find the share price window, displaying shares A-F. The price changes of shares A-F in periods 1-14 will be displayed here. To give you an idea of shares' past price changes, you will also find the prices

of periods -3, -2, -1 and 0. In the following you are given an overview of the price changes of the shares A-F in the periods -3, -2, -1 and 0.



Possibilities of decisions in the experiment

The upper part of the window is the share price window:

- The array labeled ‘price’ displays the exact price of a share in the current period. For instance, in the screen shot share A had a price of 76 Talers in period -3.
- Furthermore, the array ‘Bought/sold’ displays the number of bought/sold shares in the current period. The screen uses the following symbols: ‘– –‘ which means that there was no transaction. ‘1’ which means that one share was bought. ‘–1’ which means that one share was sold.

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.

- The array ‘number owned’ displays the current number of shares owned
- 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.

- The array ‘endowment’ displays your endowment.

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.

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 Talers = 550 Talers and are immediately subtracted from your endowment

To buy one unit of a share you can use the button ‘Buy 1 unit’. If you intend to buy 3 units you have to push the button ‘Buy 1 unit’ three times, etc. If you want to buy five units you can push the button ‘Buy 5 units’ instead of push the button ‘Buy 1 unit’ five times.

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 money endowment. 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 and decide to sell 3 shares C.
- This will lead to a payoff of: 3 * 90 Talers = 270 Talers. This amount will be directly credited to your endowment. Afterwards you will still own one share of C.

To sell one unit of a share you can use the button ‘Sell 1 unit’. If you intend to sell 3 units you have to push the button ‘Sell 1 unit’ three times, etc. If you want to sell five units you can push the button ‘Sell 5 units’ instead of push the button ‘sell 1 unit’ five times.

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

Additional earnings and payoff

Additional earnings

Before the main experiment begins, 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.

After the three tasks are carried out the main experiment starts (instructions in written form).

In the main experiment, you have to submit guesses on the stock typs. 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.

Payoff

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

Total payoff = endowment which was not invested by the participant who decides for you + value of the shares in the portfolio of this participant + earnings of your guesses + your earnings from the three additional tasks.

The total payoff of the participant on behalf of which you are deciding will earn in the experiment:

Total payoff = your endowment which was not invested + value of the shares in your portfolio + earnings of this participants guesses + earnings of this participant from the three additional tasks.