Causes, consequences, and cures of myopic loss aversion - An experimental investigation[*]

GERLINDE FELLNER[a] and MATTHIAS SUTTER[b]

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Abstract

Myopic loss aversion (MLA) has been established as one prominent explanation for the equity premium puzzle. In this paper we address two issues related to the effects of MLA on risky investment decisions. First, we assess the relative impact of feedback frequency and investment flexibility (via the investment horizon) on risky investments. Second, given that we observe higher investments with a longer investment horizon, we examine conditions under which investors might endogenously opt for a longer investment horizon in order to avoid the negative effects of MLA on investments. We find in our experimental study that investment flexibility seems to be at least as relevant as feedback frequency for the effects of myopic loss aversion. When subjects are given the choice to opt for a long or short investment horizon, there is no clear preference for either. Yet, if subjects face a default horizon (either long or short), there is rather little switching from the one to the other horizon, showing that a default might work to attenuate the effects of MLA. However, *if* subjects switch, they are more often willing to switch from the long to the short horizon than vice versa, suggesting a preference for higher investment flexibility.

Keywords: loss aversion, risk, investment, experiment

JEL Codes: C91, D80, G11

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[a] Corresponding author. University of Bonn, Department of Economics, Adenauerallee 24-42, 53113 Bonn, e-mail: fellner@uni-bonn.de.

[b] Max Planck Institute for Economics Jena and University of Innsbruck

1. Introduction

The concept of myopic loss aversion (MLA) has been introduced by Benartzi and Thaler (1995) to explain the puzzling evidence that stock markets offer an abnormally high equity premium, which is known as the equity premium puzzle (Mehra and Prescott, 1985). In this paper, we focus on two major research questions related to MLA. First, we examine whether MLA is rather caused by differences in the feedback frequency that subjects receive on their investments or by differences in the investment horizon of subjects. We find in our experimental investigation that the length of the investment horizon is critical. Given this finding, we address, second, how MLA can be contained or attenuated. Hence, we look for behavioral interventions that make subjects opt for longer investment horizons in order to avoid the negative effects of MLA. It turns out that setting a (long) default investment horizon does the trick.

Myopic loss aversion relies on two behavioral hypotheses: (i) loss aversion, i.e. that individuals' disutility from suffering a loss is higher than the utility from receiving an equally high gain (see Kahneman and Tversky, 1979; Tversky and Kahneman, 1992), and (ii) mental accounting, with the latter implying for financial decision making that long term investments are evaluated according to their short term returns (see Kahneman and Tversky, 1984; Thaler, 1985). Assuming that investors suffer from MLA, an abnormally high equity premium can be rationalized in that stocks are relatively unattractive for the investors due to the fact that stock prices fluctuate and generate not only frequent gains, but also losses. Based on econometric estimations of real financial markets data, Benartzi and Thaler (1995) have argued that the size of the equity premium is consistent with investors who weigh losses two times larger than gains and evaluate their portfolios on an annual basis.

In contrast to this indirect test of MLA, several experiments have tried to provide direct evidence of the phenomenon. Thaler, Tversky, Kahneman and Schwartz (1997) conducted an experiment where subjects could invest in two funds, a low risk and return fund corresponding to a real five-year bond, and a high risk and return fund mimicking a stock-index fund.[1] Subjects had to learn about risk and return distributions with

[1] Expected returns were positive for both funds.

experience. When providing feedback, investment returns were aggregated to reflect a monthly, yearly or five-yearly horizon depending on the treatment. Results showed that investment in the more risky fund was highest in the five-yearly condition followed by the yearly condition. The aggregation of outcomes apparently was enough to reduce the experience of losses and thus, to increase investment levels.

Gneezy and Potters (1997) conducted a similar paper and- pencil experiment demonstrating the same effect. Participants were confronted with twelve rounds in which they could invest their endowment of 200 Dollar-Cents. The investment opportunity was a risky lottery with a probability of two thirds to lose the amount and a probability of one third to win 3.5 times the amount invested. Two treatments were considered: in the "high" treatment, subjects could decide how much to invest in every round and received feedback about the return after each round. In the "low" treatment, subjects could decide on their investment amount only every third round (which was then fixed for the next three rounds) and also received aggregated feedback after three rounds, so that gains or losses could not be attributed to a particular round. In the "low" treatment, subjects invested significantly more in the risky lottery than in the "high" treatment demonstrating that a longer evaluation period makes a risky option with positive expected return look more attractive. This finding has been replicated in several other experiments, like in the context of an asset market (Gneezy, Kapetyn and Potters, 2003), in a repeated choice task with minimal information (Barron and Erev, 2003), with groups and individuals as decision makers (Sutter, 2005), and it has been confirmed to exist to an even greater extent in professional traders (Haigh and List, 2005).

In most of the previous experiments it has been argued, though, that less frequent feedback makes risky investments more attractive, when in fact yet another variable is varied simultaneously: the investment horizon or, expressed alternatively, investment flexibility. Individuals learned about joint returns over a specific period of time and also had to commit their investment for that time span. Thus, myopic loss aversion might not only crucially depend on feedback frequency but also on the investment horizon. To address this question is the first purpose of our paper.

Independently of our study, Langer and Weber (2003) as well as Bellemare, Krause, Kröger and Zhang (2005) also examined the relative importance of feedback frequency and investment flexibility for MLA. We became aware of their studies only after completion of our experiment. Whereas Bellemare et al. (2005) find that solely feedback frequency determines the effects of MLA, Langer and Weber (2003) identify the investment flexibility as the relevant factor.[2] In our experiment, we replicate the design of Gneezy and Potters (1997) and can confirm their earlier findings that less frequent feedback *and* lower investment flexibility increases risky investments compared to frequent feedback *and* high flexibility. However, similar to Langer and Weber (2003), we find that investment flexibility is the crucial factor for shaping behavior: even if feedback on returns is provided frequently, less investment flexibility, i.e. a longer investment horizon, increases investments and thus attenuates myopic loss aversion.

After having demonstrated the importance of investment flexibility, we turn to our second research question: if myopic loss aversion distorts investment behavior, how can this bias be overcome? Recently, practitioners as well as policy makers have become concerned with the adequate design and presentation of investment information in order to counter individual biases.[3] To design a behavioral intervention, it is, first of all, necessary to investigate individuals' preferences for high or low investment flexibility. On the aggregate, we find no clear preference, but subjects choose high and low flexibility rather equally often. In order to possibly influence subjects' endogenous choice of investment flexibility we set up another experimental condition where subjects were informed about the average payoff previously achieved by subjects with either high or low flexibility. Yet, this additional information does not induce subjects to choose low flexibility more often either, although low flexibility promises higher returns. Finally, setting a longer investment horizon (i.e. low flexibility) as default seems to resolve the problem: although free to switch between high and low investment

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[2] Note that Langer and Weber (2003) use a multiplicative payoff scheme, which might be closer to real world conditions. Yet, whether the payoff scheme is additive (like in Gneezy and Potters, 1997) or multiplicative has no effect on the prevalence of MLA.

[3] One important field of application in this respect is, for instance, the choice of a retirement savings plan (Benartzi and Thaler, 2004; Mitchell and Utkus, 2003).

flexibility at small costs, most individuals stick to the status quo that they are offered. It thus seems that decision inertia can be used to guide behavior to achieve the desirable outcome. Remarkably though, individuals rather switch from low to high flexibility than vice versa, indicating a slight discomfort with longer investment horizons.

The rest of the paper is organized as follows. Section 2 gives an overview of the basic experimental design. Section 3 is devoted to our first research question on the possible driving forces of MLA, either investment flexibility or feedback frequency. Section 4 presents the treatments addressing our second research question, namely how to design a behavioral intervention that makes subjects choose a longer investment horizon, i.e. lower investment flexibility. Section 5 reports a comprehensive econometric estimation of the determinants of investment levels in all treatments. Besides considering the influence of the investment horizon, the econometric model captures the influence of past behavior and past realizations of investments. The latter aspects have not been taken into account in previous papers on MLA, and therefore add further insights into the determinants of investment behavior. Section 6 concludes the paper.

2. Basic experimental setup

The experiment consists of 18 rounds. The basic investment task is equivalent to Gneezy and Potters (1997). Subjects are endowed with 100 ECU (experimental currency units)[4] in every round and can decide to keep it with zero interest or invest any amount $X \in [0, 100]$ in a risky lottery. If the lottery wins (with probability ⅓), subjects win 2.5 times the amount invested (in addition to keeping their initial endowment). If the lottery loses (with probability ⅔), the amount invested is lost. Therefore, the profit π_i^t of individual i in round t is given as:

$$\pi_i^t = \begin{cases} 100 + 2.5X & \text{with probability } \frac{1}{3} \\ 100 - X & \text{with probability } \frac{2}{3} \end{cases} \quad (1)$$

[4] 100 ECU correspond to 50 Euro-Cent.

From equation (1) it follows that if the individual chooses to invest nothing in the risky lottery (X = 0), she earns the endowment of 100 with certainty.

In total, 289 subjects from Jena University were recruited to participate in a series of experimental treatments which are described in detail below. Subjects were invited for participation by using the recruitment system ORSEE (Greiner, 2004), and the sessions were run computerized using the software z-Tree (Fischbacher, 1999). Each of the treatments was conducted in a separate session. One session lasted on average for 40 minutes, and participants earned on average 12.4 €, including a show up fee of 2.5 € (SD= 2.7 €).

3. On the influence of investment flexibility and information feedback (Treatment *Exogenous*)

3.1 Experimental design

To explore the impact of investment flexibility on risky investments, we fix feedback frequency and vary the investment horizon in two groups: In the condition with a short investment horizon (H1), participants have to decide on the risky investment in each single round. I.e. they have a high flexibility in changing their investments. In the condition with a long investment horizon (H3), subjects must decide every third round about the level of investment in the next three rounds, subject to the restriction that the investment level X has to be identical in all three rounds. Hence, condition H3 represents the case of low investment flexibility.

In both conditions, H1 and H3, participants receive feedback on their investment return after every round, i.e. the feedback frequency on investments is high in both cases and is not varied. Thus, if it is solely frequent feedback that causes myopic loss aversion, more or less flexibility in making investment decisions should not matter and no difference in risky investments between conditions is expected.

However, to be able to compare our findings to the results of previous studies, we additionally introduce a third condition (H3F3) with low flexibility (an investment horizon of three rounds), where feedback information is provided aggregated for a respective sequence of three rounds. If reporting the aggregated feedback reduces the experience of losses, it might have an additional (positive) effect on investments.[5] In total, 90 subjects participated in this treatment, which we call *Exogenous* treatment, because the investment horizon was exogenously imposed on subjects by the experimenter. In each of the three conditions of the *Exogenous* treatment (H1, H3, and H3F3) we had 30 subjects.

3.2 Results in the *Exogenous* treatment

Figure 1 displays the average investments in the risky lottery. Overall, subjects invest 64.8 ECU in H3, but only 33.3 ECU in H1 ($z = 4.05$, $p < 0.01$; Mann-Whitney U-test). This shows that an increase in the length of the investment horizon (from short in H1 to long in H3) increases investments significantly. Hence, lower investment flexibility is beneficial for investments.

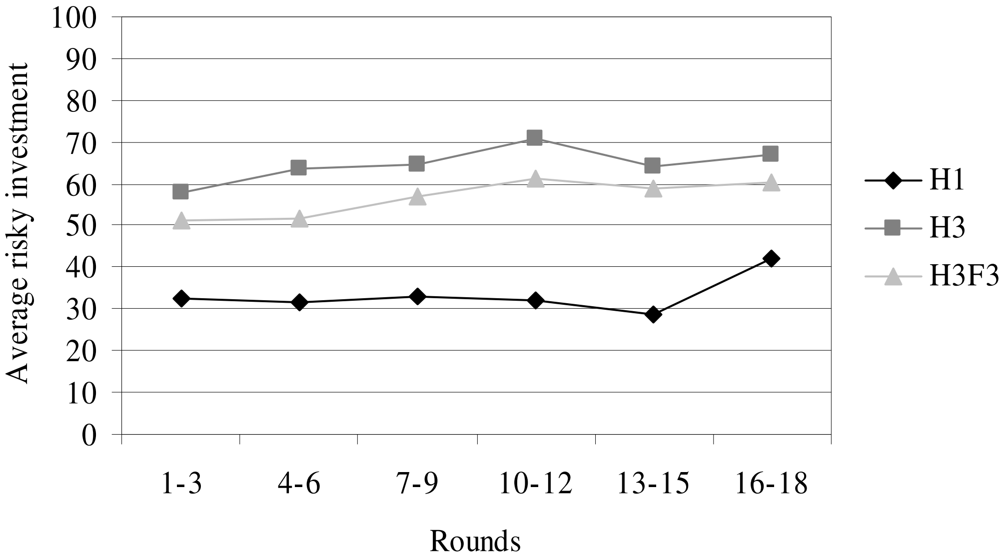

Figure 1: Treatment *Exogenous*

[5] We do not consider a treatment where subjects could decide on their investments in every round, but received feedback only in aggregated form after three rounds, because it seemed implausible from a practical point of view.

Less frequent feedback in addition to low flexibility (H3F3) has no additional effect, though. There is no significant difference between investments in the conditions H3 and H3F3 (with an overall average of 56.6) ($z = 1.28$, $p = 0.2$). In fact, Figure 1 even demonstrates that in each block of three rounds, investments are on average *higher* with more frequent feedback (H3) than with less frequent feedback (H3F3). This indicates that it is rather the investment flexibility than feedback frequency that drives the results on myopic loss aversion: Less flexibility in modifying investments generates higher investment levels even when investment returns, and thus gains and losses, are frequently monitored.

Finally, comparing the condition with high flexibility and frequent feedback (H1) and the condition with low flexibility and low feedback frequency (H3F3) allows a direct comparison with – and confirmation of – the results of Gneezy and Potters (1997). Investments are higher with less frequent feedback and less flexibility ($z = 3.14$, $p < 0.01$).

4. Designing behavioral interventions to fight myopic loss aversion

4.1 Treatment *Endogenous* – Examining investors' preferences for investment flexibility

If a longer investment horizon is able to attenuate the negative consequences of myopic loss aversion, it is important to find out what may induce individuals to commit to a longer investment horizon, or put differently, to forgo investment flexibility. As a precondition for giving policy advice, it is, however, important to find out subjects' preferences for high or low investment flexibility in a first step. Given that all previous experimental studies on MLA and investment decisions have determined the feedback frequency and the investment horizon exogenously, there is so far no evidence available on subjects' preferred investment flexibility when they can choose it endogenously. Therefore, we examine subjects' preferences in our treatment *Endogenous*.

4.1.1 Experimental design

In the *Endogenous* Treatment, subjects can choose their preferred investment horizon (H1 or H3) before the first round starts. No further switching is possible throughout the 18 rounds. Feedback on returns is provided after every round.

There are two conditions in this treatment. In the *No-Profit* condition, we explain the game to subjects and then let them choose the investment horizon. In the *Profit* condition subjects are additionally informed about the average profits for the different horizons that had resulted in the *Exogenous* treatment (with 9.35€ in H1, and 10.10€ in H3, excluding the show-up fee). In total, we had 53 subjects participating in the *No-Profit* condition and 28 subjects in the *Profit* condition.

4.1.2 Results in the *Endogenous* treatment

In the *No-Profit* condition, 32 subjects (60.4%) chose the short horizon H1 and 21 subjects (39.6%) the long one H3. Obviously, endogenous choice does not induce individuals to commit to a longer investment horizon. In fact, the frequencies of choosing the long or the short horizon are not significantly different from a random draw, indicating that in the aggregate there is no clear cut preference for either horizon. Average risky investments of both groups over the 18 rounds are displayed in Figure 2. Although subjects who choose H3 invest, on average, more than subjects who choose H1 (53.5 versus 46.2 overall), a Mann-Whitney U-Test can not confirm a significant difference between investments. (z = -1.02, p = 0.31).

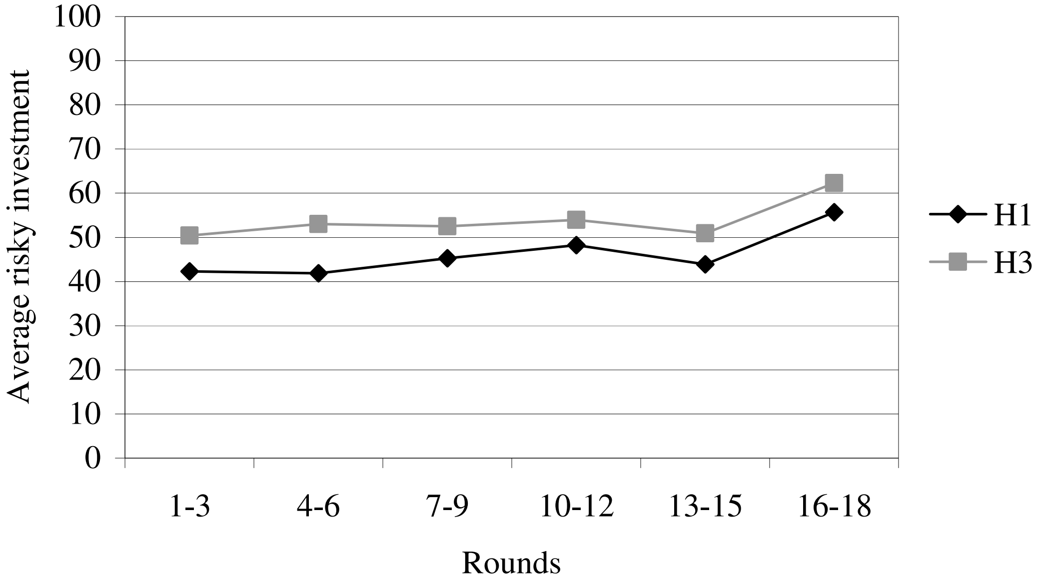

Figure 2: Treatment *Endogenous – No-Profit* condition

In the *Profit* condition, each investment horizon was chosen by exactly 14 subjects. As expected, the longer investment H3 triggers, on average, higher investments (75.6 versus 33.4; Mann-Whitney U-Test: $z = 3.15$, $p < 0.01$).

Though the relative frequency of choosing the long horizon is somewhat higher in the *Profit* condition (50%) than in the *No-Profit* condition (39.6%) the difference is insignificant. This means that adding information about the higher profits with the long horizon H3 is an inadequate intervention to make subjects choose the longer investment horizon (i.e. accept a lower investment flexibility) more often.

If endogenous choice and the prospect of higher profits does not prompt individuals to commit to a longer investment horizon, as would be beneficial, assigning them to a longer investment horizon by default may do. This is explored in our next, the *Default* treatment.

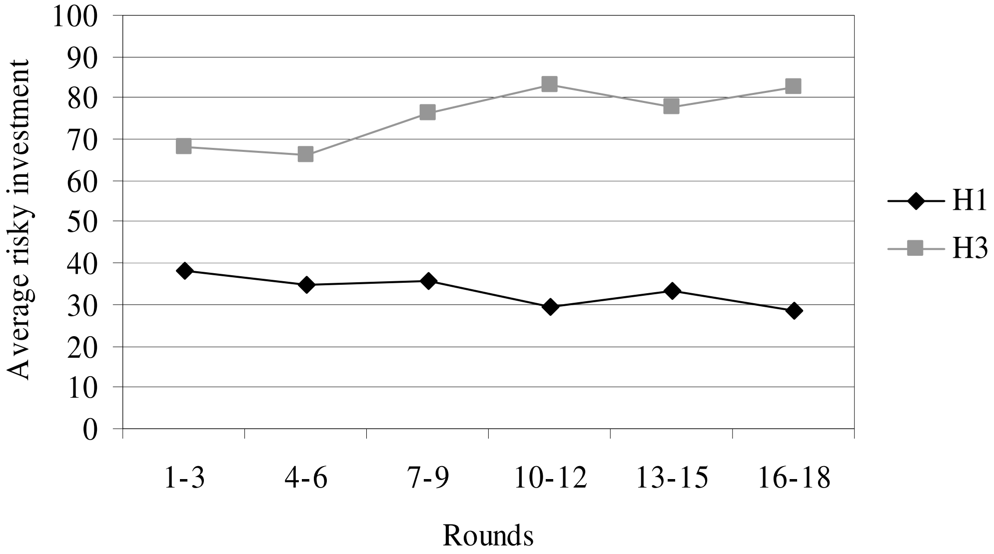

Figure 3: Treatment *Endogenous* – *Profit* Condition

4.2 Treatment *Default* – Setting a default horizon with an option to switch

4.2.1 Experimental design

At the beginning of the experiment, subjects were assigned by default to either a short or a long investment horizon, i.e. to condition H1 or H3. However, they were offered the chance to switch from the short to the long horizon or vice versa (after having played the first three rounds in the default condition). Switching was possible every third round[6] at a one-time fixed cost of 40 ECU.[7] Compared to the previous treatments, the *Default* treatment offers subjects complete autarky over their horizon (every third round), but simply exposes subjects to a default condition at the beginning.

[6] The restriction to switch only every third round was chosen in order to keep investment decisions in H1 and H3 comparable.

[7] If someone switches after the third round, the switching costs amount to about 2.6% of his total sum of endowments in rounds 4-18. Of course, switching becomes relatively more expense (in relation to one's endowment in the remaining periods), but if a subject has a clear preference for the alternative horizon – instead of the default horizon – he should anyhow switch immediately right after round 3.

In total, we had 118 participants in *Default*, of which 60 were assigned by default to high flexibility (condition H1) and 58 were assigned to low flexibility (condition H3).

4.2.2 Results in the *Default* treatment

Figure 4 displays the cumulative number of subjects switching to the alternative condition (from H1 to H3 and vice versa) for every block of three rounds. At most four out of the 60 subjects (6.7%) switch from a short (H1) to a long investment horizon (H3). Switching is more frequent with the long horizon default, though. By round 7, 12 subjects have switched from long to short commitment and by round 16 this number increases to 15, i.e. 26% of the 58 participants. The difference in switching frequencies is significant according to a χ^2-test ($p < 0.01$). This finding indicates that individuals are more eager to switch to more flexibility than to less flexibility.

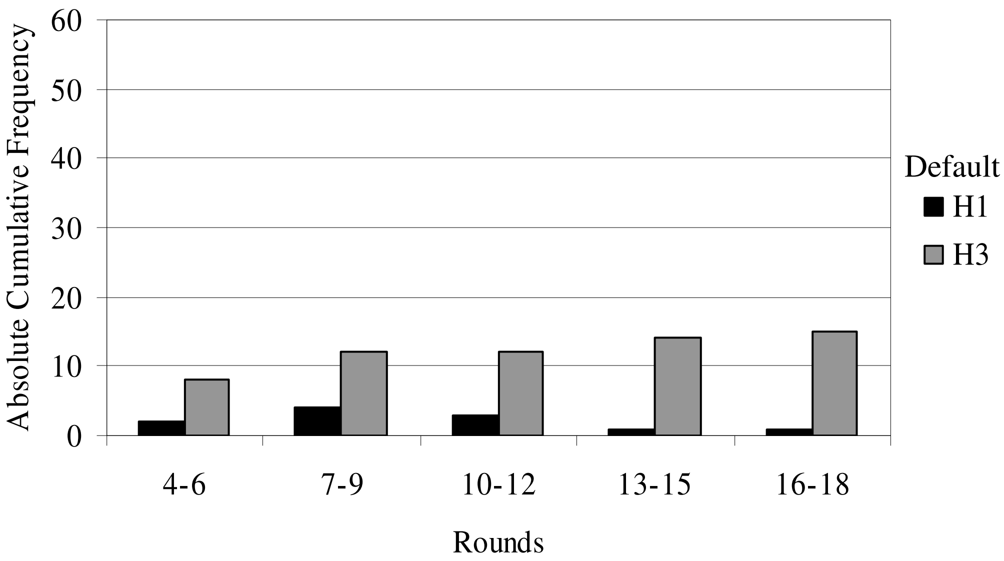

Figure 4: Treatment *Default* – Cumulative number of subjects opting for alternative horizon

However, even though subjects switch more often from the long horizon to the short horizon, the important message from Figure 4 is the fact that at least 74% (43 out of 58) of subjects stick to the long horizon when exposed to such a default. This frequency of voluntarily investing under the long horizon, i.e. with less flexibility, is significantly larger than the frequencies of subjects opting for the long horizon in treatment *Endogenous*, both compared to the *No-Profit* condition ($p < 0.01$; χ^2-test) and to the *Profit* condition ($p < 0.05$; χ^2-test). Hence, the behavioral intervention of setting a default fits the purpose of keeping subjects to invest under a long horizon with low investment flexibility.

Figure 5 shows investment patterns in *Default* across rounds. We find again that subjects with the short horizon default (H1) always invest less in the risky lottery than subjects with the long horizon default (H3). Overall averages are 52.5 in H3 vs. 40.9 in H1 ($z = 2.04$, $p = 0.02$; Mann-Whitney U-test).

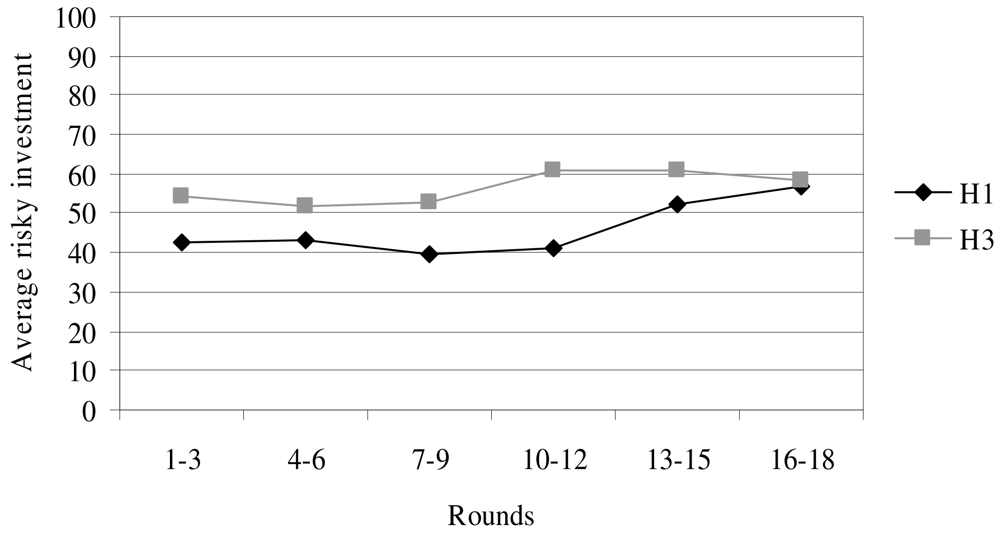

Figure 5: Treatment Default

The opportunity to switch horizons allows also for a within-subjects test of the effects of horizons on investment decisions. Since only four subjects out of 58 switched from the H1-default to the long horizon (H3), we cannot reasonably test for the within subjects differences in the H1-default. Yet, with the H3-default we have a total of 17 subjects who experienced both H1 and H3 by at least switching once from H3 to H1. Interestingly, we find no differences in investment levels within these 17 subjects between H1 and H3 (with average investments of 51.5 in H1 versus 53.4 in H3; Wilcoxon signed ranks test, $z = 0.83$, $p = 0.22$). Hence, it seems that the initial default itself induces rather high investment levels which are not even significantly reduced when a subjects switches 'back' to the high flexibility condition (H1). Investments under the default H3 therefore seem to provide an anchor which is robust to switching. Finally, we have also checked whether those subjects who switched from the H3-default to H1 have different investment levels than those who did not switch. This is not the case. Comparing only investment levels under H3, we find no significant differences between those subjects who switched at least once and those who never switched ($z = 0.22$, $p = 0.42$; Mann-Whitney U-test).[8]

5. The determinants of behavior over time and across treatments

Somewhat surprisingly, the previous experimental studies on MLA did not take the time pattern of investment behavior into account, most probably because their main focus was the aggregate effect of MLA. Yet, an analysis of investment behavior over time may yield some further insights into the determinants of investments, especially on the impact of a pre-determined versus a self-determined investment horizon Therefore, we have estimated a Tobit panel regression model where the dependent variable is the amount invested in the lottery, aggregated in rounds of three.[9] As independent variables we take, first of all, the investment horizon (0 = H1, 1 = H3). Additionally, we consider several variables reflecting experience throughout the course of the experiment:

[8] We have also examined whether investment decisions differ between the *Default* treatment and the *Exogenous* treatment. Whereas subjects with a short horizon invest more in the Default treatment (45.9 vs. 33.3, $z = 1.89$, $p = 0.03$), we find no significant difference for the long horizon ($z = 1.31$, $p = 0.1$ in H3; Mann-Whitney U-tests).

[9] The aggregation is necessary since investment levels do not change for three rounds whenever the investment horizon is long (i.e. H3).

accumulated wealth up to the recent sequence of three rounds, the *accumulated number of all previous lottery wins* (ranging from 0 to a maximum of 9 in our sessions), the number of *lottery wins in the previous period of three rounds* (from 0 to 3). These variables allow us to examine how subjects react to past outcomes of their investments, which can be reasonably assumed to have an influence on investment behavior (also on real markets). Finally, we include dummy variables for the different treatments and conditions in our experiment.[10] By additionally distinguishing the treatments with pre-determined investment horizons (in *Exogenous*) from those treatments where subjects can endogenously choose their investment horizon (in *Exogenous* or *Default*), we can examine whether the option to choose the investment horizon has an impact on investment levels (controlling for the investment horizon itself).

Table 1 reports three different model specifications,[11] starting on the left-hand side with a full model, including interaction effects of the endogenous *choice* of the investment horizon (0 = exogeous, 1 = endogenous) and the different parameters capturing experience. The positive regression coefficient for investment horizon confirms that a longer investment horizon leads to significantly higher investments (which holds true in all model specifications). The negative coefficient of the number of wins in the previous block of three rounds suggests that individuals invest less risky after repeated gains, or vice versa, invest more risky after a repeated number of losses, resembling the house money effect. At the same time it supports myopia in that people react strongest to very recent gains and losses. The dummy for the exogenous treatment is significant and negative, indicating that a pre-determined investment horizon leads to a lower level of investments than a self-determined investment horizon.

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[10] The condition H3F3 is excluded from the analysis, since the variation of investment horizon and feedback frequency does not allow aggregating the treatment with the other exogenous conditions H1 and H3, and the observations are too few for reasonably contrasting it with the other treatments.

[11] The significant mean value of random errors due to unobserved individual heterogeneity (σ_u) and the relatively high proportion of the error term in total residuals due to individual heterogeneity (ρ) both confirm the need of using a random effects model.

Table 1: Tobit panel regression on lottery investment

Dependent Variable:	*Full Model*		*Exogenous*		*Endogenous*	
Investment $X_i^t \in [0,100]$	*coef.*	*Se*	*coef.*	*se*	*coef.*	*se*
Constant	45.32**	4.19	21.52**	4.32	46.12**	4.29
Investment horizon *(0 = H1, 1 = H3)*	46.53**	4.41	46.49**	4.24	17.37**	3.85
Accumulated wealth	0.01	0.01	0.01	0.01	-0.01	0.01
Number of all previous wins	-1.08	1.90	-1.09	1.72	5.40**	1.88
Number of wins in previous three rounds	-4.61**	2.22	-4.65*	2.07	-11.66**	1.40
Treatment Exogenous	-24.28**	6.15	—		—	
Treatment Endogenous – No Profit Condition	4.29	5.82	—		4.18	5.84
Treatment Endogenous – Profit Condition	-5.80	5.00	—		-5.85	5.13
Treatment Default	-6.59	5.35	—		-6.46	5.68
*Choice * Horizon*	-29.28**	5.66	—		—	
*Choice * Accumulated Wealth*	-0.02	0.01	—		—	
*Choice * Number of all previous wins*	6.51*	2.63	—		—	
*Choice * Number of wins in previous three rounds*	-7.01**	2.60	—		—	
σ_u^2	38.28**	1.62	38.55**	2.86	38.38**	1.99
σ_i^2	21.99**	0.56	20.63**	1.03	22.43**	0.66
ρ	.75		.78		.75	
log likelihood	-4767.91		-1108.31		-3658.55	
# of observations	1295		300		995	
# uncensored / # left censored / # right censored	943 / 87 / 265		225 / 23 / 52		718 / 64 / 213	

*Significance levels: * $p \leq 0.05$ ** $p \leq 0.01$*

Several interaction effects between endogenous choice and the length of the investment horizon and the parameters of previous experience, respectively, reveal some fundamental differences between the exogenous and endogenous determination of the investment horizon. The third and fourth columns of Table 1 therefore show the Tobit regressions separately for exogenous and endogenous investment horizons, illustrating the nature of the interaction effects in the full model.

The first fact to catch one's eye from comparing the *Exogenous* with the *Endogenous* model is that the coefficient of the investment horizon is significantly larger in the exogenous treatments than in the endogenous ones. Obviously, the endogenous choice of the investment horizon seems to reduce the negative effect of myopic loss aversion on investments, but still does not eliminate it. The second noteworthy feature is that subjects react significantly to prior gains and losses when the investment horizon is endogenous, but much less so when the investment horizon is pre-determined. Subjects in the exogenous treatment react more weakly to most recent gains and losses and do not react to former ones. Individuals in the endogenous treatments invest more cautiously the higher the number of recent wins (in the previous three rounds), but more risky the higher the accumulated number of previous wins. No differences between the three endogenous treatments can be found as indicated by the non-significant dummy variables.

6. Summary and discussion

Since the seminal paper of Benartzi and Thaler (1995) myopic loss aversion has been identified as one explanation why investors might invest less into risky assets when returns are frequently evaluated and the length of the investment horizon is rather short than when feedback frequency is lower and commitment to an investment level higher. In this paper we have tried to disentangle the causes of myopic loss aversion and to put forward possible cures for it.

Whereas most previous papers have stressed the role of feedback frequency for MLA, attempts to disentangle the relative importance of feedback frequency and the investment horizon have only been undertaken recently – and independently from each other. We have identified the length of commitment to a given investment as a crucial factor for the level of risky investments. With lower investment flexibility – and, thus, longer investment horizons – subjects invest more in the risky lottery, even if they receive frequent feedback on gains and losses. The same conclusions have been drawn by Langer and Weber (2003), who also found the investment horizon to be more important than feedback frequency. Bellemare et al. (2005), however, report the opposite results in that feedback frequency is relatively more important than the investment horizon. Though partly emphasizing different causes of MLA, the common denominator of all three studies is the fact that a manipulation of feedback frequency *and/or* investment flexibility leads to different investment levels. Given the consensus on this fact, it seems a natural next step to search for behavioral interventions to attenuate the effects of MLA. This has been the second – and main – focus of our paper.

Looking at the aggregate distribution of choices, we have found no particular preference for either high or low investment flexibility among participants when they can endogenously choose the investment horizon. Rather, high or low flexibility is chosen almost equally often. Remarkably, even when subjects learn that longer commitment results, on average, in higher profits (via higher investments), no clear-cut preference for either horizon emerges.

Setting the longer investment horizon as default (with a switching option) has been found to be a successful behavioral intervention that makes more than 75% of subjects stay with the long horizon and low flexibility. These subjects invest significantly more in the risky lottery than those subjects with a short horizon and high flexibility as default. This result is important for two reasons. First, it demonstrates that the effects of MLA also prevail when subjects can choose the investment horizon themselves. Hence, the influence of MLA is not restricted to settings where the horizon is exogenously determined by the experimenter, as has been the case in all previous studies. Second, the effects of MLA can actually be exploited by setting the long horizon as a default, thereby inducing higher investments (with higher expected returns). The latter result is remarkably similar to the effects of setting a default in 401(k) plan enrollment in U.S. companies. As Choi et al. (2001, 2003), for instance, have shown, enrollment in retirement savings plans is much higher (sometimes by a factor of four) when new employees are enrolled by default in the savings plan and when they have to opt out (by making a phone call to the personnel office) than when they have to opt in (also by simply making a call). In our experiment, we have found that at most 25% of subjects opt out from the long investment horizon. Opting out from the short investment horizon was significantly lower at about 6%, which indicates that subjects seem to have a preference for high investment flexibility, even though it is costly for them.

Though the exogenous or endogenous determination of a subject's investment horizon does not matter for the prevalence of MLA, a closer examination of investment patterns over time reveals that individuals who are able to choose their investment horizon endogenously react differently to prior gains and losses than individuals who were exogenously assigned an investment horizon. Subjects in the endogenous treatments react positively to a higher total number of previous wins, but negatively to a higher number of previous wins in the most recent three rounds. This suggests a belief in some kind of (short term) trend reversion, also known as gambler's fallacy (e.g., Clotfelter and Cook, 1993). If the number of wins in the previous three rounds was high, one may expect it to be lower in the upcoming three rounds and therefore reduce the investments. However, in the longer term, if the number of previous wins was high (and therefore potentially also accumulated earnings) one may decide to risk more money, which is in line with the house money effect (Thaler and Johnson, 1990).

In sum, it seems that subjects who choose the investment horizon themselves are more actively managing their investments, as they react significantly to past experience concerning losses and gains, whereas subjects with an exogenous assignment of the investment horizon seem much more passive and rather unaffected by past experience. An additional difference between endogenous and exogenous determination of the investment horizon has been found with respect to the magnitude of myopic loss aversion. When subjects have autonomy over their investment horizon (in treatments *Endogenous* and *Default*), the effect of myopic loss aversion is, on aggregate, less pronounced than when subjects have no autonomy. This, however, implies that all previous experiments with an exogenous assignment of the investment horizon may have measured an upper limit of the effects of MLA, since in the real world, investors can be considered to have a high degree of autonomy in determining their investment flexibility. It is important to stress, however, that even with full autonomy our results suggest that MLA negatively affects investment levels. Therefore, behavioral interventions – like setting a default – may be beneficial.

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