Limits to Myopic Loss Aversion and Learning

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Abstract

This paper investigates the effects of limiting the evaluation period in a typical experiment to measure myopic loss aversion (MLA). We corroborate previous results and found that the aggregation effect had diminishing returns. This indicates that there is a point where limiting investor access to the results of the portfolio ceases to yield a significant MLA. We also found evidence of a learning process occurring during the experiment.

Key words*: Myopic Loss Aversion. Prospect Theory. Aggregation of Results.*
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1. Introduction

This paper tests the Myopic Loss Aversion (MLA hereafter, Benartzi and Thaler (1995)) hypothesis according to which investors show myopic behavior by evaluating the individual return of assets in a portfolio rather than assessing them together, and (or) evaluating them over a short period.

We used a new experiment to evaluate the existence of a limit to the effect that information and choice aggregation has on risk behavior and the presence of learning on participant behavior. Results show that MLA is positively related to the frequency of performance information and the flexibility of choice. However, the effect of information and choice aggregation on MLA decreased, revealing a nonlinear relationship between them. Results also indicate a learning curve during the experiment.

Several experiments replicated the Gneezy and Potters (1997) (GP hereafter) experiment and confirmed their findings [Haigh and List (2005); Bellemare et al. (2005); Fernandes et al. (2006); Sutter (2007); Fellner and Sutter (2009); Blavatskyy and Pogrebna (2009); Eriksen and Kvaloy (2010); Larson et al. (2016); Iturbe-Ormaexe et al. (2019)]. Ponti and Tomás (2021) measured the marginal effects of the time-frequency and time-horizon dimensions of the GP investment game design. Our results confirm Ponti and Tomás (2021) findings, and show that, on average, aggregation increases the bet less than proportionally to the rise in restrictions.

Moreover, our results indicate that the marginal decreasing effect of aggregation on MLA seems to be caused by learning. Our analysis showed that the difference in the average values between treatments drops as the game progresses, suggesting possible learning during the experiment and that a greater understanding of the game produces a lower incidence of MLA. However, this potential learning process was not sufficient to eliminate the incidence of myopia.

In addition to this Introduction, Section 2 presents the experimental design and procedures. Section 3 describes the results, and Section 4 our concluding remarks.

2. Experimental design and procedures

Our experimental design used eighteen rounds where participants had to choose how much to bet in the lottery that offered *a 2/3 (67%) chance of losing the amount bet and a 1/3 (33%) chance of winning two and a half times the amount.* Even though the chance of losing was higher than the chance of winning, the expected value of this lottery was 1/6 of the bet, which is positive. We divided participants into groups with distinct betting rules: H, L, and E. We set up Groups H and L exactly as in GP, but gave participants in Group E less flexibility to make decisions than in previous experiments.

Participants in Group H received feedback on their bets after each round and could alter their choices in every round (18 decisions). Information on returns and the opportunity to play was made available to Group L every three rounds (6 choices in total). Participants in Group E received feedback every six rounds (information on all six returns was made available to all participants after the six periods, participants in group E made 3 choices in total). We limited the decision-making process by allocating equal values to each block of bets (three decisions at $t = 1$, $t = 6$, and $t = 12$). This setup reduced the incidence of MLA in Group L compared to Group H, and in Group E compared to Groups H and L.

Each participant received an endowment of 100 currency units in each round. Individuals in Group H chose an X amount of this endowment ($0 \leq X \leq 100$) to bet in the lottery. They were informed of the lottery's probability distribution and the payoffs obtained in each round. Their payoffs would be 100 monetary units plus 2.5 times the amount bet in case of a win or 100 monetary units minus the amount bet in case of a loss. When the participant lost, we deducted the amount of the X bet from the endowment (100 currency units), and the participant kept the remaining ($100 - X$). However, they could not use this balance in the subsequent round. Participants received an additional endowment of 100 in the following round and could bet any X amount again ($0 \leq X \leq 100$). Similar to prior studies, participants were only allowed to bet the endowment they received in each round, although they may have accumulated the total amount in the previous rounds.

The software automatically set the bets for the subsequent three rounds ($t, t+1, t+2$) after the Group L participant made the decision in t. The results of the lottery and the gains obtained were reported together after each block of three rounds. For instance, a participant who bet 100 currency units in t also placed this bet in $t+1$ and $t+2$, and lost in t and $t+1$, but won in $t+2$ was simultaneously informed in $t+3$ of the performance of each bet (0 in t, 0 in $t+1$ and $100 + 2.5 \times 100$ in $t+2$) for an aggregate result of 350 monetary units.

Finally, the software automatically set the bets for the following six rounds ($t, t+1, \ldots, t+5$) after the Group E participant made the decision in t. The results for each lottery and the total amount obtained were reported together after each block of six rounds.

After each participant registered the amount of the bet, the software performed the draw and recorded the time the participant took to make the decision and its subsequent performance. The values accrued in each round and the balance accumulated during the experiment were informed afterwards, according to the Group the participant belonged to. The accumulated gain was the sum of the values won with each bet, and the gain per round a value between 0 and 350 currency units. We paid the total return in Brazilian Reais, with 100 monetary units equivalent to R$ 0.50 (US$ 0.12)[1]. Payments varied from R$ 0.00, if the participant bet 100 currency units in all rounds and had only losses, to R$ 31.50 if the participant kept this same strategy but only had wins. One-third of the participants was drawn in each session to be entitled to payment, and we informed participants of this procedure.

We recruited 287 undergraduate students at the Federal University of Tocantins (UFT) between October 2018 and March 2019[2]. The final sample contained 269 participants since we excluded 18 for making the bet decision too rapidly. Thus, 81 students received Treatment H, 91 participated in Group L, and 96 received Treatment E. We performed 15 experimental sessions at a computer lab with approximately 20 students present simultaneously. We positioned participants at spaced terminals, and no conversation was allowed between them.

3. Results

We compared the average percentages of the endowment (100 currency units) bet in the lottery by participants in the groups in three rounds (1-3;4-6;7-9;10-12;13-15;16-18). We also compared these percentages by clustering the periods in blocks of nine and overall (1-9;10-18;1-18).

On average, participants bet more in Group E than in Groups L and H. Also on average, they bet more in Group L than in Group H. Considering all rounds, the proportion of the amount of the endowment bet was, on average, 44.44% in Group E, 41.33% in Group L, and 33.26% in Group H. The percentage difference between L and H was higher than between E and L, indicating that the average bet increased when feedback and choices were limited, but was less than proportional with the increase in restrictions.

We observed this result for all blocks of rounds except for the last three rounds (16-18), when this percentage difference was slightly greater between Groups E and L.

Figure 1 displays another test of this hypothesis using a simple regression [$bet = a + b(aggregation) + c(aggregation)^2$], where the amount bet (bet) is a quadratic function of the number of rounds for which information and the choice were limited ($aggregation$).

The regression results reveal a nonlinear relationship between aggregation and MLA (the values of a, b, and c were 39.98(98.68), 312.15(11.07) and -81.57(-2.89), respectively, with the

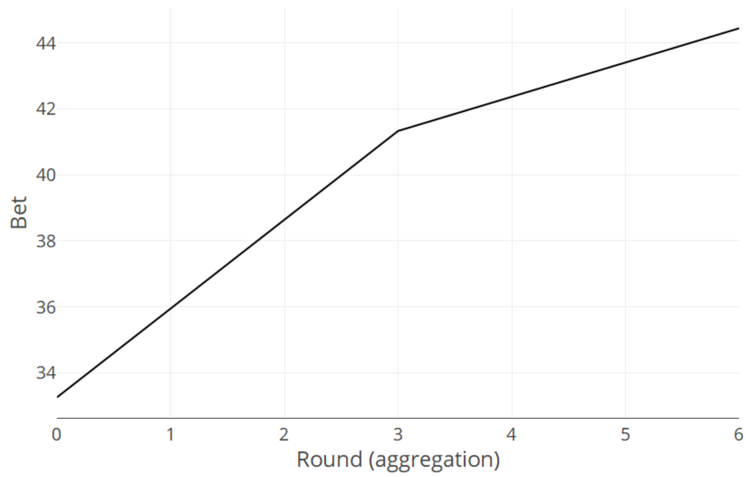
[1]One US dollar = 4.17 Reais on November 12, 2019, at 17:53.

[2]Morais, Marcleiton (2023), "Limits to MLA and Learning", Mendeley Data, V1, doi: 10.17632/gbypg9zky3.1

standard errors in brackets). A concave function could represent this relationship if a continuous set of restrictions were adopted.

The bet values were examined considering the Shapiro-Wilk normality test, which returned a p-value < 0.01 for all blocks of rounds, indicating that their distribution was significantly different than a normal one. This is not surprising since bet values were truncated by a lower bound (0) and an upper bound (100). Table 1 shows the nonparametric Wilcoxon Signed Rank Test with continuity correction to the pairwise comparison of treatment groups, and the Kruskal-Wallis Rank Sum Test for the difference in averages for all groups.

Figure 1: *Nonlinear regression of betting and aggregation of choices and results*



The results of these tests show that the differences were statistically significant at 5%, considering most block and group comparisons. No significance was observed in the pairwise comparison LxE in blocks (1-3), (4-6), (10-12), and (13-15). This may suggest that reducing the frequency of information and the choice flexibility between Groups L and E did not significantly affect the incidence of MLA.

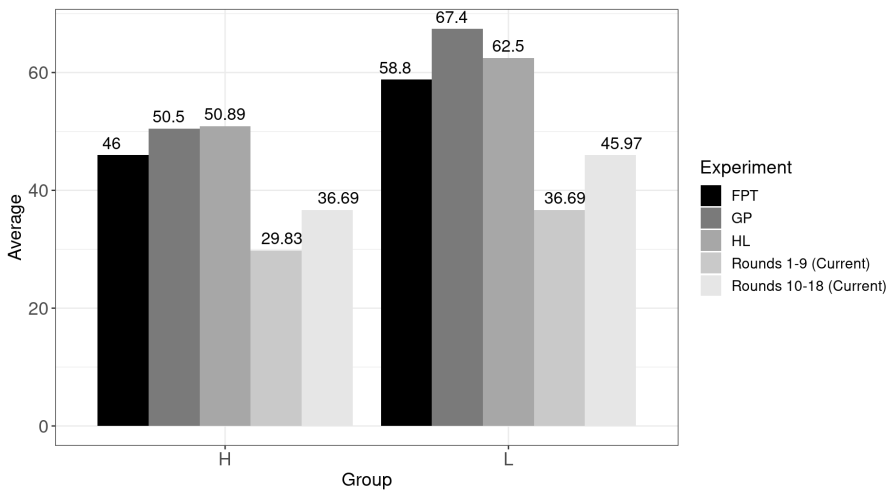
Table 1: *p-value from a nonparametric variance analysis*

Rounds	HxL*	HxE*	LxE*	All**
1-3	0.000	0.000	0.150	0.000
4-6	0.004	0.003	0.853	0.001
7-9	0.000	0.000	0.039	0.000
10-12	0.000	0.000	0.440	0.000
13-15	0.000	0.000	0.590	0.000
16-18	0.008	0.000	0.038	0.000
1-9	0.000	0.000	0.028	0.000
10-18	0.000	0.000	0.049	0.000
1-18	0.000	0.000	0.003	0.000

Note: *Pairwise Wilcoxon rank sum test, **Kruskal-Wallis rank sum test.

We also compared the results of the first nine rounds of this experiment with those obtained in three other studies: GP, Haigh and List (2005) (HL) and Fernandes et al. (2006) (FPT) in Figure 2. Our results are consistent with previous studies regarding the trend of lower risk aversion for Treatment L. On average, participants in Group L bet 22.8% more than those in Group H. In the GP, HL, and FPT studies, these values were 33%, 23%, and 27%, respectively. However, the percentage of the endowment bet by the participants of this study was lower than in those studies. This difference may be explained by the fact that our experiment was computer-based and not paper-based as in previous experiments. This indicates greater participation dynamism than when pen and paper are used to record the bets. More computer-based experiments may help test this hypothesis.

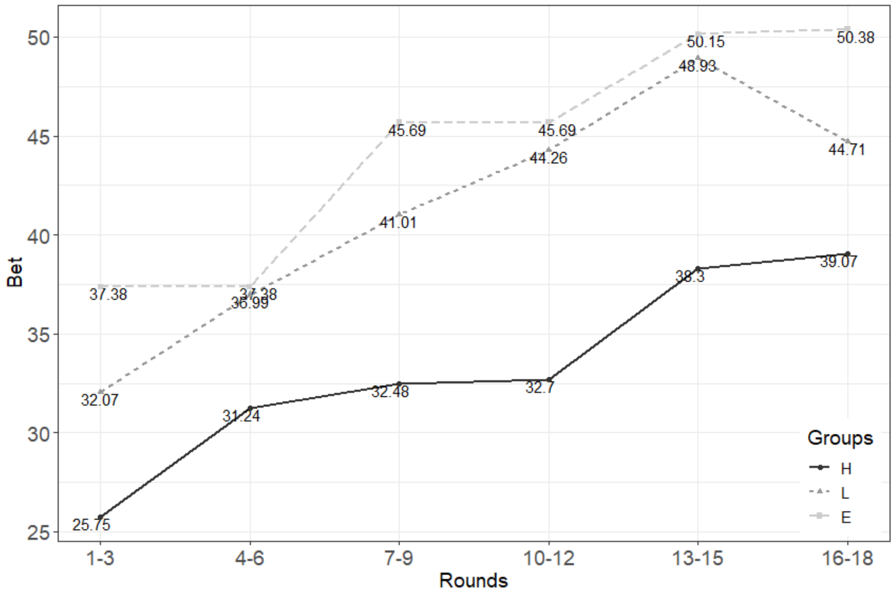
Figure 2: *Comparing the current average bet with previous studies*



Adding more rounds to the experiment allowed us to analyze participant learning of betting strategies. The evolution in average bets by rounds revealed that participants were learning during the experiment, given that the expected value of the lottery indicated that they could, on average, earn more if they bet more. Figure 3 displays the evolution of the average bet by three-round blocks. The increase in the percentage of the endowment bet between the first and last blocks was 12.58% for Group E, 12.64% for Treatment L, and 13.32% in H. This suggests a lower effect of MLA during the course of the experiment, confirming the findings of Ponti and Tomás (2021).

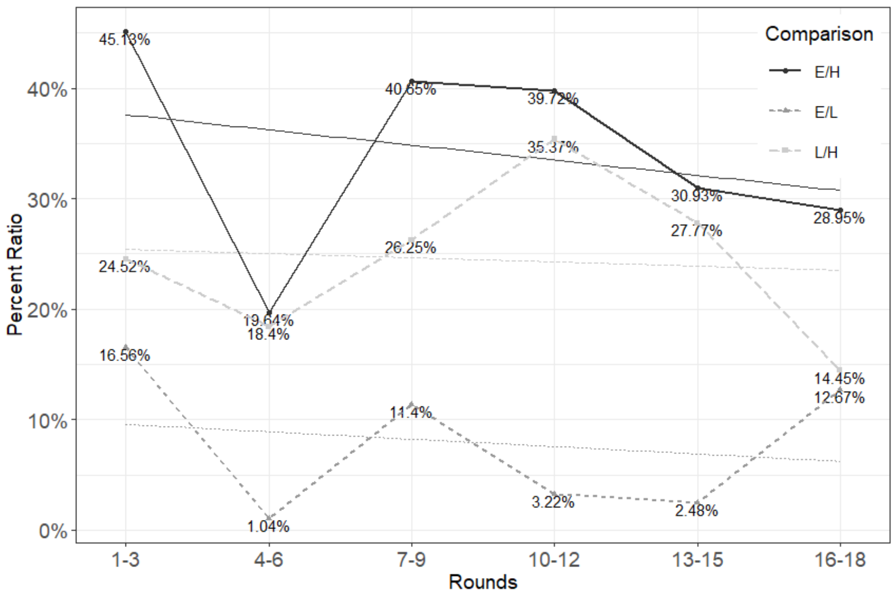
Learning can also reduce the difference in the average bets between groups when participants experience more repetitions of the lottery because the expected value is the same between the different treatments. The reduction in these average differences suggests that the learning process tends to eliminate myopia. Figure 4 shows, in percentage terms, the change in the ratio

Figure 3: *Evolution of average bets per round*



of the average bets in comparisons between Treatments E and H, E and L, and L and H. This ratio decreased from 45.13% in the first block of rounds to 28.95% in the last on in the E/H comparison; from 24.52% to 14.45% in E/L, and from 16.56% to 12.67% in L/H, respectively. The difference in the mean values between treatments dropped as the experiment progressed, suggesting a learning process was taking place during the experiment and that participants' better understanding of the game lowered the incidence of MLA. However, the difference was not eliminated in the 18th round. The increase in the number of periods was insufficient to completely neutralize the difference in bets.

Figure 4: *Difference between the average bets by groups*



4. Conclusion

We expanded the experiment designed by Gneezy and Potters (1997) by including more rounds and a new treatment group. We tested whether a higher level of aggregation in information and choices further mitigated the effect of MLA on participant behavior.

Results show that the presence of MLA was positively related to the information frequency and the flexibility of choice, and negatively associated with aggregation.

On average, aggregation increased the number of currency units bet but in a way that was less than proportional to the enhancement in restrictions. Thus, greater aggregation had a decreasing effect on MLA.

A learning mechanism in individual betting strategies could explain the diminishing influence of aggregation on MLA as the game progressed. Results show that the average bet increased as the rounds were played in line with the positive relationship between the expected value of the lottery and the amount bet. This result suggests that risk aversion decreases as the number of game repetitions increases. As the expected value was the same across treatments, reductions in the differences between group averages imply learning.

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