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Edited by Research Department (Depep) – E-mail: workingpaper@bcb.gov.br

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Myopic Loss Aversion and House-Money Effect Overseas: an experimental approach*

José L. B. Fernandes**
Juan Ignacio Peña***
Benjamin M. Tabak****

Abstract

Recent literature has advocated that risk-taking behavior is influenced by prior monetary gains and losses. On one hand, after perceiving monetary gains, people are willing to take more risk. This effect is known as the house-money effect. Another stream of the literature, based on prospect theory and loss aversion, suggests that people are risk averse/seeking in the gain/loss domain. We employ a survey approach and find evidence of a house money effect. However, in an experiment performed in a dynamic financial setting, we show that the house money effect disappears, and that loss aversion is the dominant effect.
Keywords: Loss Aversion, House Money, Behavioral Biases.
JEL Classification: C91, D81

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** Universidad Carlos III de Madrid and Banco Central do Brasil. E-mail: jbarros@emp.uc3m.es.

*** Universidad Carlos III de Madrid. E-mail: ypenya@eco.uc3m.es.

**** Universidade Católica de Brasília and Banco Central do Brasil. E-mail: benjamin.tabak@bcb.gov.br.

Behavioral concepts have been used to provide explanations for several financial market inefficiencies found in empirical studies. Behavior economists argue that the prospect of losses seems more damaging than looking at the entire wealth, even if the average outcome is the same. This sort of myopia in the face of losses may explain much of the irrationality some agents display in financial markets.

In this sense, several empirical studies [Tversky and Kahneman, 1992] have shown that when dealing with gains, agents are risk averse, but when choices involve losses, agents are risk seeking. Moreover in a wide variety of domains, people are significantly more averse to losses than they are attracted to same-sized gains [Rabin, 1998]. Loss aversion is a relevant psychological concept that has been imported to financial and economic analysis, which represents the foundation of prospect theory. As Schmidt and Zank [2005] highlighted, for original prospect theory, utility being steeper for losses than for gains is equivalent to loss aversion[1].

Previous studies have presented a controversial result concerning the effects of loss aversion (escalation of commitment) and house-money on the risk taking behavior of agents in a multiple investment period horizon. Fernandes, Peña and Tabak [2006], in a theoretical study about traders' compensation, proposed that if traders performed poorly in a period, they tend to choose riskier investments the following period. However, considering the house-money effect, traders who have earned profits in the first period that exceed some benchmark level would become less risk averse in the following period, because they would feel that they were gambling with the house-money [Coval and Shumway, 2005].

Benartzi and Thaler [1995] proposed a new behavioral theory — myopic loss aversion (MLA) as an explanation for the equity premium puzzle [Mehra and Prescott, 1985]. MLA combines two behavioral concepts, loss aversion and mental accounting, where the latter is related to how individuals employ implicit methods to evaluate the consequence of their decisions.

Gneezy and Potters [1997], Thaler *et al.* [1997], Gneezy *et al.* [2003] and Haigh and List [2005] have provided experimental evidence supporting MLA[2]. In their experiments, they change the feedback frequency of investment decisions and find that agents tend to invest more when the performance of their decisions is assessed more infrequently.

Thaler and Johnson [1990] show that when faced with sequential gambles, people are more risk-taking if they earned money on prior gambles than if they lost. The

intuition is that losses are less painful to people when they occur after a gain rather than when losses happen after a previous loss. This effect is known in the financial literature as the house-money effect. Gneezy *et al.* [2003] investigate the house-money effect in a market experiment, and find a significant positive effect of lagged profits on expenditures on assets.

In this paper, we test the house-money effect following Thaler and Johnson [1990], and find strong evidence of it. We then modify the experiment conducted in Gneezy and Potters [1997] and Haigh and List [2005] to test which effect is dominant: the house-money effect or the MLA. This experiment was conducted on students in Brazil and Spain, and results suggest that the MLA effect dominates the house-money effect. Therefore, in an experiment that replicates the dynamics of decision making, the house-money effects disappears.

Weber and Zuchel [2003] investigate the influence of prior outcomes on risk attitude in a framework close to our approach. They found that the prospect presentation might influence the risk attitude of subjects after prior outcomes. They observed that in the "portfolio treatment", subjects take significantly greater risk following a loss than a gain. On the other hand, in the "lottery treatment", there was greater risk taking after a gain than after a loss. However, in their experiment, subjects participated in only one sequence of two periods, so they were not given the opportunity to learn by participating in several rounds. Also, their within-subject design aiming to get the impact of prior outcomes is unnatural and unrealistic. There's clearly a difference in asking for the behavior of a subject in the face of gains or losses; and the direct observation of his attitude facing risky dynamic decisions. Our experimental design overcomes these previous limitations.

The remainder of this paper proceeds as follows. In the next section, we provide a brief theoretical background of MLA and house-money effects. In section II we describe our experimental design. In section III we present the results and section IV concludes the paper, highlighting the main findings.

I. Theoretical Background

Benartzi and Thaler [1995] were the first to propose the myopic loss aversion (MLA) concept to elucidate the equity premium puzzle raised by Mehra and Prescott [1985]. This puzzle refers to the fact that despite stocks have provided a more favorable risk-return profile, investors were still willing to buy bonds. Benartzi and Thaler took

advantage of two behavioral concepts to solve the puzzle: loss aversion and mental accounting. They included the impact of anticipated emotions on decision-making. Anticipated emotions are those that decision-makers expect to experience given a certain outcome. They demonstrated that the size of the equity premium is consistent with the investors evaluating their investments annually, and weighting losses about twice as heavily as gains.

The approach of Benartzi and Thaler [1995] was not direct (experimental) evidence of MLA. However, Gneezy and Potters [1997] conducted an experiment that produced evidence to support the behavioral hypothesis of myopic loss aversion. Haigh and List [2005], in another experiment with undergraduate students and traders from the CBOT, in a design similar to the one proposed by Gneezy and Potters [1997], found evidence of myopic loss aversion (MLA), and that traders exhibit behavior consistent with MLA to a greater extent than students. In the experiment, they evaluated the participation of the agents in a certain lottery, changing the frequency of information provided to them. Bellamare *et al.* [2005], in another experiment similar to Gneezy and Potters [1997], distinguish the effects of information feedback and investment flexibility over the myopic loss aversion. They found that varying the amount of information, alone, suffices to induce the behavior that is in line with the myopic loss aversion. However, Langer and Weber [2003] found a strong MLA effect depending on the length of commitment, a much less pronounced effect of feedback, and a strong interaction between both variables. The effect of the feedback frequency was reversed for a long binding period.

There is ample evidence that feelings do significantly influence decision-making, especially when the decision involves conditions of risk and/or uncertainty (see Lucey and Dowling [2005] for a recent review). The consideration of risk as feeling can be presented as in the figure I. The idea is to incorporate the fact that the emotions people experience at the time of making a decision influence their eventual decision. Supported by psychologist's research, the risk as feeling model is based on three premises: cognitive evaluations induce emotional reactions; emotions inform cognitive evaluations; and feelings can affect behavior.

In our paper, we extend the previous model, by considering a multi-period analysis, suggesting a feedback process in which the experienced outcomes, whether they were positive or negative, will influence the following decision-making process inducing a different risk taking behavior. In other words, realized outcomes have an

impact on the anticipated outcomes, emotions and subject probabilities; which will deviate the risk taking decision of the subject from what is predicted by standard utility functions.

Insert Figure I about here

Assume the following example to highlight the influence of MLA in the individual decision making process. Suppose an agent is loss averse, and weights losses relative to gains at a rate of > 1. Consider also that the agent is evaluating the possibility of taking part in a lottery, in which he has probability p of losing $\$L$, and probability $(1 - p)$ of winning $\$W$. So the expected utility of the lottery is $E(U_1) = (1-p)(W) + \lambda p(-L)$, and the agent should accept the gamble if E(U) > 0 or $\lambda < \frac{(1-p)(W)}{p(L)}$. Now, if the agent is evaluating the possibility of participating in an n-round lottery, each with the same payoff as the previous one, the expected utility is now given by:

(1) $$E(U_n) = nW(1-p)^n + [(n-1)W - \lambda L](1-p)^{n-1} p + ... + \lambda (p)^n (-nL).$$

For instance, for values n =1, L= 1, p= 2/3 and W =2.5, the agent should accept the gamble if < 1.25. When n =3 the agent should accept the gamble if < 1.56. As the number of rounds in the lottery increases, the gamble becomes more attractive to increasingly loss-averse agents.

Translating the previous framework to the financial market, if agents evaluate their investments more often, there will be more occasions when the risky asset (stocks) underperforms the safe asset (bonds). As individuals are loss averse, those occasions would generate to them a greater dissatisfaction, so they will tend to avoid the risky asset. Conversely, if agents evaluate their investments over longer time periods, the risky asset will rarely underperform the safe asset, and the investors will face losses more seldom. In this case, the loss averse agent will be more comfortable taking more risk.

Related to MLA, our experimental design modifies the experiment proposed in Gneezy and Potters [1997] and Haigh and List [2005]. In order to test which effect is dominant, loss aversion or house-money, we change the experiment and allow

participants to accumulate previous gains. We explain our experiment in depth in the next section.

The house-money effect, proposed in Thaler and Johnson [1990], suggests that the risk tolerance of an agent increases as his wealth increases as a consequence of previous gains. To explain this effect, they developed Quasi-Hedonic Editing (QHE) Theory, which considers that decision makers segregate recent gains from their initial position, but they do not segregate recent losses. Because they have segregated their prior winnings from their initial wealth, future losses will appear less damaging, as they are losing someone else's money (the house-money). While investigating the CBOT, Coval and Shumway [2005] found evidence that traders who have earned profits in the morning that exceed some benchmark level become less risk averse in the afternoon because they are "gambling with the house-money". Slattery and Ganster [2002] found that decision maker who had failed to reach their goals, set lower, less risky goals in subsequent decisions.

On the other hand, loss aversion would predict that traders with profitable mornings would reduce their exposure to afternoon risk trying to avoid loses and so guaranteeing the previous gains [Fernandes, Peña and Tabak, 2006]. This is based on a behavior effect called "escalation of commitment". One major explanation for this effect is based on the value function from prospect theory. When subjects use the wealth they bring to the experiment plus any initial endowment in the experiment as reference point, any loss in the experiment will be perceived as a loss, not as a reduced gain as in the hedonic-editing case. The intuition is that, due to the convex shape of the value function in the range of losses, risk-seeking behavior will prevail in the case of prior losses. As empirical evidence of the escalation situation, we can give Odean [1998] and Weber and Camerer [1998] where investors sell stocks that trade above the purchase price (winners) relatively more often than stocks that trade below purchase price (losers). Both works interpreted this behavior as evidence of decreased risk aversion after a loss, and increased risk aversion after a gain.

Ackert *et al.* [2006] pointed out the previous contradiction between loss aversion and house-money, however they argue that prospect theory was developed for one-shot games, and so it cannot be applied to a multi-period setting. They provide the results of a multi-period experiment that gives evidence of house-money instead of loss aversion. Nevertheless, the way they test house-money is by changing the initial amount given to the subjects, and so the change in the individual wealth is not a result of the individual's

choices. We argue here, based on the risk as feeling ideas, that an experienced outcome will impact future individual's decisions, and so we could perfectly observe the loss aversion effect. In this paper, we want to address the influence of previous losses (or gains) in future risk-taking decisions. The following two competing hypotheses can be formulated, based on escalation of commitment (loss aversion) and on the house-money effect, respectively:

Hypothesis 1(LA): Within a dynamic environment, decision makers who receive negative (positive) feedback in a period will take more (less) risk in the following period.

Hypothesis 2(H-M): Within a dynamic environment, decision makers who receive negative (positive) feedback in a period will take less (more) risk in the following period.

As pointed out by Brennan [2001], the house-money effect is just one of at least three behavioral stories about how an investor will respond to good or bad news. Biased self-attribution causes the investor to become more confident as his previous positive assessment of the investment is confirmed, and therefore, he will be willing to take more risk; an effect similar to the one proposed by the house-money effect. On the other hand, the disposition effect suggests that investors become more risk averse as their stocks increase in value, in line with the loss aversion prediction.

In order to elucidate the previous contradiction, we use an experimental design similar to that of Gneezy and Potters [1997] and Haigh and List [2005], except that we change the rules for the amount available to be invested by the subjects, and the number of rounds. The experimental design is fully described in the following section.

II. Experimental Design

We have two hypotheses to investigate: the MLA and the house-money effect. To study the MLA effect we followed closely the experimental design proposed by Haigh and List [2005]. We used a straightforward 2 X 2 experimental design (see Table I). With this setting, it's not only possible to verify the existence of MLA, but also to investigate if there's any country effect. Both groups of students were selected from undergraduate courses of Management and Economics. They were evaluated in two distinct treatments: Treatment F (denoting frequent feedback) and Treatment I (denoting infrequent feedback).

Insert Table I about here

In Treatment F, our control group, subjects took part in a twelve-round lottery. In each round, they were endowed with 100 units[3] and had to decide how much to bet in a lottery, which pays two and a half times the amount invested with one-third of probability, and zero with two-thirds of probability. The subjects were previously informed about the probabilities, payoffs and mechanism of the lottery, and so they were aware that they could win from zero to 350 in each round, depending on the amount invested. The experimental instructions for students in each treatment are given in the Appendix. After the twelve rounds, all individual results were summed and the final amount was paid.

In opposite of Treatment F, we used the Treatment I (infrequent feedback), which is similar to the frequent treatment, except that subjects place their bets in blocks of three. Agents decide just before round t, how much to invest in rounds t, t +1 and t + 2. Following the suggestion made in the literature, we restricted the bets to be homogeneous across the three rounds. After all the subjects placed their blocks of bets, they were informed about the combined results.

Based on the MLA effect, it's expected that students in the Treatment F will invest less in the lottery, compared to those in Treatment I, as they face losses more often and are loss averse. Subjects in Treatment I face losses less often, and so should be willing to take more risk.

In order to check the house-money effect, we again used a 2 x 2 experimental design summarized in Table II. With this setting it's not only possible to verify the existence of the house-money effect, but also to investigate if there's any country effect. As in the previous setting, both groups of students were selected from undergraduate courses of Management and Economics.They were evaluated in two distinct treatments: Treatment IR (Isolated Results) and Treatment C (Cumulative Results).

Insert Table II about here

In fact, Treatment IR is the same as Treatment F and so the group is the same (control group). In opposite of Treatment IR, we used Treatment C (cumulative results), which is similar to the IR treatment, except that the amount available to invest in each pair round (t = 2, 4, 6, 8, 10 and 12) was the result individually obtained in the previous round (t = 1, 3, 5, 7, 9 and 11) respectively, plus the 100 units corresponding to that round. The idea is to proxy an incentive scheme, where the trader is paid a base salary; say 100, plus a bonus based on his last period performance. The results were given to the subjects and checked after each round.

Evidence that past winners invest more in the following period is consistent with the house-money effect. Otherwise, we have an indication that the loss aversion effect is more relevant, since the past winners are willing to take less risk to avoid future losses. It could be argued that the decisions in our proposed economic experiment could be distorted, because the money the subjects risk comes from the experimenter, rather than their own pockets. However, Clark [2002] found no evidence of the previous distortion, suggesting that use of "free" initial money endowments does not have an impact on the final experimental results. On the other hand, there are good reasons for supplying subjects with starting funds in experiments. Specifically, it facilitates recruitment, and allows subjects to make decisions in the realm of losses without leaving the experiment in debt. Also, since we are investigating future risk decisions after experiencing a loss (gain), our results tend to be more reinforced than if subjects were using their own money.

Some final remarks about the experiment: we recruited 85 subjects for the Brazilian group from the Universidade Católica de Brasília and 97 subjects for the Spanish group from the Universidad Carlos III de Madrid. The treatment was run from January to April 2006, in a classroom in Spain and another in Brazil. Subjects were seated apart from each other avoiding communication. No more than 15 students were evaluated at a time. Each subject could take part in only one treatment group. All treatments were run using pencil and paper. After each round, experimenters circulated to check whether the subjects were calculating the payoffs correctly. To determine if a subject wins or loses in a round depends on the winning color previously settled for each participant: green, yellow or red. If the individual winning color is equal to the one randomly defined by the experimenter for that round, the subject wins; otherwise she loses. In order to compare our results with the work of Thaler and Johnson [1990], we

included two questions taken from their questionnaire in our experiment. We also included two control variables: sex and age.

III. Results

The descriptive statistics of the sample are presented in Table III. In total, we had 182 subjects taken from Brazil (85 students) and Spain (97 students). In terms of sex distribution, the sample is equitative except for treatment C (Brazil), which had 75.8% of men. The average age of the participants was similar across the treatments, with the Brazilian subjects being slightly older.

Insert Table III about here

The main variable of interest is the amount invested by the students in the lottery, since we want to infer their risk aversion. From Table 3, we observe that the average bet varied from 40.10 to 66.02 among the treatment groups. Figure II shows the average bets for all groups. To maintain consistency with previous literature, we first make a non-parametric analysis of the results. We observe a country effect, with Spanish students being less risk averse than Brazilian subjects in all treatment groups. Since MLA predicts that subjects in the F treatment should invest less than those in the I treatment, we directly observe their means in each country. Related to Brazil, the group F had an average investment of 40.10, while the I treatment had 55.38. The results for the Spanish subjects follow the same tendency, with the F group having 54.42, and the I treatment 66.02. In both samples, the predictions of MLA were verified and our results were close to the ones found by Haigh and List [2005]: 50.89 (group F) and 62.5 (group I).

Insert Figure II about here

To determine the significance of the differences, we used the non-parametric Mann-Whitney test[4]. Table IV presents the results segregated by groups of three rounds. The Table can be read as follows: row 1, column 1, at the intersection of “Rounds 1-3”

and “Treatment F”, denotes that the average student in Treatment F bet 45.9 (with a standard deviation of 30.9) units in rounds 1-3. As a comparison, column 2 in the same row indicates that the average student in Treatment I bets 55.7 (standard deviation of 28.1) in the same rounds.

Considering the whole sample, the average investment of group F was 48.3 and that of group I was 61.1, with a Mann-Whitney statistic of -7.49 (p-value of 0.000), indicating that these averages are statistically different. When we consider the time evolution of the bets, we observe the same pattern, with group F investing consistently less than group I. When we compare treatments F and C, the previous difference disappears. The average student in treatment C invested 46.8 (standard deviation of 30.9) over all rounds, and the Mann-Whitney statistic when compared to the F group equals to 0.71 (p-value of 0.480), hence indicating no statistical difference.

Insert Table IV about here

In order to investigate age and sex effects, we grouped the results accordingly, reaching the numbers presented in Tables V and VI. The results are not clear, with some sex effect appearing in the groups I and C, and age effect being significant in group F.

Insert Table V about here

Insert Table VI about here

Table VII presents the investment results of treatments F, C and I, grouped by country. We can observe a significant country effect in treatments F and I with subjects in Spain being consistently less risk averse, while group C didn’t present a statistically significant difference[5].

Insert Table VII about here

To infer the house-money effect, Table VIII presents the average investment decision in each group, considering the decision taken after a loss and after a gain. Contradicting the predictions of the house-money effect, subjects invested more after a loss and less after a gain, supporting the theory of the escalation of commitment. The previous result is robust to the change of treatment.

An interesting result is that when we asked the subjects about their risk preferences, in line with Thaler and Johnson [1990], we found that 79% of the students would increase their bets after a gain and just 37% would invest after a loss; thereby supporting the house-money effect. What we conclude from these findings is that the prospect of a loss (gain) is different from the experience of a loss (gain), and in a dynamic environment, the outcome effect dominates the individual's previous cognitive evaluation. Previous papers [Haigh and List, 2005; Bellamare et al, 2005; Gneezy and Potters, 1997] didn't find conclusive results about this dynamic risk aversion behavior.

Insert Table VIII about here

Although the previous analysis already gives support to hypothesis 1, and rejects hypothesis 2, we can implement the statistical inference controlling for the panel data nature of our data. As in Haigh and List [2005], to provide a test for robustness, we estimate a panel data regression model, in which we regressed the individual bet on a dummy variable for the country, a dummy variable for the treatment and on the interaction between the two. The results are presented in Table IX, in which we can observe a significant country effect.

Considering students from groups F and I, the average student from Spain invests 10.40 more than a Brazilian student. The treatment effect is also significant among groups F and I, indicating that students from treatment F, on average, invest 16.87 less than the students from group I, again supporting the MLA predictions. When

we consider the students from treatments F and C, both country and treatment effects are diminished.

Insert Table IX about here

Finally, to investigate the house-money effect, we regressed students' bets on a dummy variable indicating if the student had a prior gain or loss, a dummy for the treatment and their interaction. Table X provides the results. When we consider students from groups F and I, no significant win/lose effect is found, which is in agreement with previous results found in the literature that use an experimental design close to ours.

Insert Table X about here

If we investigate groups F and C, the fact that having a prior gain induces a significant reduction in the amount invested by 22.68, gives support to our hypothesis 1, and rejects the house-money effect. It also indicates that our experimental design (treatment C) could identify the effects investigated in this paper.

IV. Concluding Remarks

In the behavior finance literature, experiments were used to identify or give support to the existence of behavioral biases, which could clarify market anomalies. Nevertheless, those experiments were mainly made in unique locations: the USA or Europe. Moreover, two of these behavioral effects - house-money and loss aversion - lead to controversial results when we analyze the risk taking behavior of agents in a multi-period investment horizon.

Our results support the existence of MLA over the countries but a country effect is also found, indicating that care should be taken when generalizing behaviorial findings over the international financial market. No sex or age effect was found in the sample. Finally, and most importantly, loss aversion is found to govern the risk-taking behavior of subjects in dynamic settings, overcoming the house-money effect. Subjects

that experienced a gain (loss) tend to assume less (more) risk in the following period. As further extensions we suggest the investigation of which country characteristics are generating the effect found in this paper, and also the use of other countries' students replicating the experimental design C, since we have found that there seems to be a country effect as well, which could be due to cultural differences.

Appendix A: Experimental Instructions
(Translated from Portuguese and Spanish)

Introduction [Read aloud only]

Welcome to our experimental study of decision-making. The experiment will last about 30 minutes. The instructions for the experiment are simple, and if you follow them carefully, you can earn a considerable amount of money. All the money you earn is yours to keep, and will be paid to you, privately and in cash, immediately after the experiment.

Before we start the experiment you will be asked to pick one envelope from this pile. In the envelope you will find your Registration Form. This form will be used to register your decisions and earnings. On the top of your Registration Form you will find your registration number. This number indicates behind which table you are to take a seat. When everyone is seated, we will go through the instructions of the experiment. After that, you will have the opportunity to study the instructions on your own, and to ask questions. If you have a question, please raise your hand, and I will come to your table. Please do not talk or communicate with the other participants during the experiment.

Are there any questions about what has been said until now? If not, then will the person on my left please be the first to pick an envelope, open it, and take the corresponding seat.

[Treatment F: Read aloud and distributed]

The experiment consists of 12 successive rounds. In each round you will start with an amount of 100 cents. You must decide which part of this amount (between 0 cents and 100 cents) you wish to bet in the following lottery.

You have a chance of 2/3 (67%) to lose the amount you bet and a chance of 1/3 (33%) to win two and a half times the amount bet.

You are requested to record your choice on the Registration Form. Suppose that you decide to bet an amount of X cents (0 X 100) in the lottery. Then you must fill in the amount X in the column headed *Amount in lottery*, in the row with the number of the present round.

Whether you win or lose in the lottery depends on your personal *win color*. This color is indicated on the top of your Registration Form. Your win color can be Red,

Yellow or Green, and is the same for all twelve rounds. In any round, you win in the lottery if your win color matches the *round color* that will be randomly selected and announced, and you lose if your win color does not match the round color.

The round color is determined as follows. After you have recorded your bet in the lottery for the round, the computer will randomly select one color that will be shown in the screen. If the round color matches your win color, you win in the lottery; otherwise you lose. Since there are three colors, one of which matches your win color, the chance of winning in the lottery is 1/3 (33%) and the chance of losing is 2/3 (67%).

Hence, your earnings in the lottery are determined as follows. If you have decided to put an amount X cents in the lottery, then your earnings in the lottery for the round are equal to - X if the round color does not match your win color (you lose the amount bet), and equal to (2.5X) if the round color matches your win color.

The round color will be shown in the screen and announced by the assistant. You need to record this color in the column *Round color*, under *win* or *lose*, depending on whether the round color does or does not match your win color. Also, you need to record your earnings in the lottery in the column *Earnings in lottery*. Your total earnings for the round are equal to 100 cents (your starting amount) plus your earnings in the lottery. These earnings are recorded in the column *Total Earnings*, in the row of the corresponding round. Each time we will come by to check your Registration Form.

After that, you are requested to record your choice for the next round. Again you start with an amount of 100 cents, a part of which you can bet in the lottery. The same procedure as described above determines your earnings for this round. It is noted that your private win color remains the same, but that for each round the computer selects a new color randomly. All subsequent rounds will also proceed in the same manner. After the last round has been completed, your earnings in all rounds will be totaled. This amount determines your total earnings in the experiment, which you will receive in cash after the numbers are checked.

[Treatment I: Read aloud and distributed]

The experiment consists of 12 successive rounds. In each round you will start with an amount of 100 cents. You must decide which part of this amount (between 0 cents and 100 cents) you wish to bet in the following lottery.

You have a chance of 2/3 (67%) to lose the amount you bet and a chance of 1/3 (33%) to win two and a half times the amount bet.

You are requested to record your choice on the Registration Form. Suppose that you decide to bet an amount of X cents (0 X 100) in the lottery. Then you must fill in the amount X in the column headed *Amount in lottery*. Please note that you fix your bet for the next three rounds. Thus, if you decide to bet an amount X in the lottery for round 1, then you also bet an amount X in the lottery for rounds 2 and 3. Therefore, three consecutive rounds are joined together on the Registration Form.

Whether you win or lose in the lottery depends on your personal *win color*. This color is indicated on the top of your Registration Form. Your win color can be Red, Yellow or Green, and is the same for all twelve rounds. In any round, you win in the lottery if your win color matches the *round color* that will be randomly selected and announced, and you lose if your win color does not match the round color.

The round color is determined as follows. After you have recorded your bet in the lottery for the next three rounds, the computer will randomly select one color that will be shown in the screen for each of the next three rounds. If the round color matches your win color, you win in the lottery; otherwise you lose. Since there are three colors, one of which matches your win color, the chance of winning in the lottery is 1/3 (33%) and the chance of losing is 2/3 (67%).

Hence, your earnings in the lottery for the three rounds are determined as follows. If you have decided to put an amount X cents in the lottery, then your earnings in the lottery for the round are equal to - X if the round color does not match your win color (you lose the amount bet), and equal to (2.5X) if the round color matches your win color.

The three round colors will be shown in the screen and announced by the assistant. You need to record this color in the column *Round color*, under *win* or *lose*, depending on whether the round color does or does not match your win color. Also, you need to record your earnings in the lottery in the column *Earnings in lottery*. Your total earnings for the three rounds are equal to 300 cents (your starting amount) plus your earnings in the lottery. These earnings are recorded in the column *Total Earnings*, in the row of the corresponding round. Each time we will come by to check your Registration Form.

After that, you are requested to record your choice for the next three rounds (4-6). For each of the three rounds you again start with an amount of 100 cents, a part of which you can bet in the lottery. The same procedure as described above determines your earnings for these three rounds. It is noted that your private win color remains the

same, but that for each round the computer selects a new wolor randomly. All subsequent rounds will also proceed in the same manner, also grouped by three (i.e., 7-9 and 10-12). After the last round has been completed, your earnings in all rounds will be totaled. This amount determines your total earnings in the experiment, which you will receive in cash after the numbers being checked.

[Treatment C: Read aloud and distributed]

The experiment consists of 12 successive rounds. In each odd round (1, 3, 5, 7, 9 and 11) you will start with an amount of 100 cents. In each even round (2, 4, 6, 8, 10 and 12) you will start with an amount of 100 cents plus your *Total Earnings* in the previous round. You must decide which part of this amount (between 0 cents and 100 cents for odd rounds; and between 0 cents and 100 cents plus your *Total Earnings* in the previous round for even rounds) you wish to bet in the following lottery.
You have a chance of 2/3 (67%) to lose the amount you bet and a chance of 1/3 (33%) to win two and a half times the amount bet.

You are requested to record your choice on the Registration Form. Suppose that you decide to bet an amount of X cents in the lottery. Then you must fill in the amount X in the column headed *Amount in lottery*, in the row with the number of the present round.

Whether you win or lose in the lottery depends on your personal *win color*. This color is indicated on the top of your Registration Form. Your win color can be Red, Yellow or Green, and is the same for all twelve rounds. In any round, you win in the lottery if your win color matches the *round color* that randomly selected and announced, and you lose if your win color does not match the round color.

The round color is determined as follows. After you have recorded your bet in the lottery for the round, the computer will randomly select one color that will be shown in the screen. If the round color matches your win color, you win in the lottery; otherwise you lose. Since there are three colors, one of which matches your win color, the chance of winning in the lottery is 1/3 (33%) and the chance of losing is 2/3 (67%).

Hence, your earnings in the lottery are determined as follows. If you have decided to put an amount X cents in the lottery, then your earnings in the lottery for the round are equal to - X if the round color does not match your win color (you lose the amount bet), and equal to (2.5X) if the round color matches your win color.

The round color will be shown in the screen and announced by the assistant. You need to record this color in the column *Round color*, under *win* or *lose*, depending on whether the round color does or does not match your win color. Also, you need to record your earnings in the lottery in the column *Earnings in lottery*. Your total earnings for the round are equal to 100 cents in odd rounds; or 100 cents plus your *Total Earnings* in the previous round for even rounds (your starting amount); plus your earnings in the lottery. These earnings are recorded in the column *Total Earnings*, in the row of the corresponding round. Each time we will come by to check your Registration Form.

After that, you are requested to record your choice for the next round. Again, you start with an amount of 100 cents in odd rounds or 100 cents plus your *Total Earnings* in the previous round for even rounds, a part of which you can bet in the lottery. The same procedure as described above determines your earnings for this round. It is noted that your private win color remains the same, but that for each round the computer selects a new color randomly. All subsequent rounds will also proceed in the same manner. After the last round has been completed, your earnings in all rounds will be totaled. This amount determines your total earnings in the experiment, which you will receive in cash after the numbers being checked.

Win Color: RED

REGISTRATION FORM

(Treatment F)

Name: _____

Date: ___/___/_____ Gender: Male / Female Age: ____

University: _____ Country: _____

Course: _____

Answer the following questions:

1) You have just won $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

2) You have just lost $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

Round	Amount in Lottery	Round Color	Win	Lose	Earnings in Lottery	Total Earnings
0 (test)			Win	Lose		
1			Win	Lose		
2			Win	Lose		
3			Win	Lose		
4			Win	Lose		
5			Win	Lose		
6			Win	Lose		
7			Win	Lose		
8			Win	Lose		
9			Win	Lose		
10			Win	Lose		
11			Win	Lose		
12			Win	Lose		
Total						

Recall:

Amount in Lottery (X): must be between 0 (zero) and 100 (one hunderd) cents.

Round Color: write the color randomly selected for that round.

Win / Lose: check the corresponding box depending on if you won or lost that round.

Earnings in Lottery: equals (-X) if you lost and equals (2.5 X) if you won.

Total Earnings: equals 100 plus Earnings in Lottery.

Win Color: RED

REGISTRATION FORM

(Treatment I)

Name: _____

Date: ___/___/_____ Gender: Male / Female Age: ____

University: _____ Country: _____

Course: _____

Answer the following questions:

1) You have just won $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

2) You have just lost $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

Round	Amount in Lottery	Round Color	Win	Lose	Earnings in Lottery	Total Earnings
0 (test)			Win	Lose		
1			Win	Lose		
2			Win	Lose		
3			Win	Lose		
4			Win	Lose		
5			Win	Lose		
6			Win	Lose		
7			Win	Lose		
8			Win	Lose		
9			Win	Lose		
10			Win	Lose		
11			Win	Lose		
12			Win	Lose		
Total						

Recall:

Amount in Lottery (X): must be between 0 (zero) and 100 (one hunderd) cents and it must be the same in the following 3 rounds.

Round Color: write the color randomly selected for that round.

Win / Lose: check the corresponding box depending on if you won or lost that round.

Earnings in Lottery: equals (-X) if you lost and equals (2.5 X) if you won.

Total Earnings: equals 100 plus Earnings in Lottery.

Win Color: RED

REGISTRATION FORM

(Treatment C)

Name: _____

Date: ___/___/_____ Gender: Male / Female Age: ____

University: _____ Country: _____

Course: _____

Answer the following questions:

1) You have just won $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

2) You have just lost $30. Choose between:

(a) A 50% chance to gain $9 and a 50% chance to lose $9

(b) No further gain or loss

Round	Amount in Lottery	Round Color	Win	Lose	Earnings in Lottery	Total Earnings
0 (test)			Win	Lose		
1			Win	Lose		
2			Win	Lose		
3			Win	Lose		
4			Win	Lose		
5			Win	Lose		
6			Win	Lose		
7			Win	Lose		
8			Win	Lose		
9			Win	Lose		
10			Win	Lose		
11			Win	Lose		
12			Win	Lose		
Total						

Recall:

Amount in Lottery (X): must decide between 0 cents and 100 cents for odd rounds (1, 3, 5, 7, 9); and between 0 cents and 100 cents plus your *Total Earnings* in the previous round for even rounds (2, 4, 6, 8, 10)

Round Color: write the color randomly selected for that round.

Win / Lose: check the corresponding box depending on if you won or lost that round.

Earnings in Lottery: equals (-X) if you lost and equals (2.5 X) if you won.

Total Earnings: equals 100 plus Earnings in Lottery for odd rounds (1, 3, 5, 7, 9); and equals Total Earnings in the previous round plus Earnings in Lottery for even rounds (2, 4, 6, 8, 10).

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Notes

1. Coval and Shumway [2005] found strong evidence that traders from the Chicago Board of Trade (CBOT) appear highly loss-averse, assuming high afternoon risk to recover from morning losses.

2. The reader is also referred to Langer and Weber [2005], who extend the concept of myopic loss aversion to myopic prospect theory, predicting that for specific risk profiles, where the chance of winning is much high, myopia will not decrease, but increase the attractiveness of a sequence.

3. For subjects in Brazil, 1 unit represents 1 cent of Brazilian Real, and for students in Spain, 1 unit represents 1 cent of Euro.

4. We cannot use the parametric t-test. Given the fact that subjects are confronted with an upper and lower bound for investing, the distribution must be non-normal. Moreover, results from the Kolmogorov-Smirnov test confirm the non-normality of data.

5. We believe that these results are due to a wealth effect.

Table I

Experimental Design (MLA)

Subject Type	Treatment F	Treatment I
Students from Brazil	24	28
Students from Spain	32	32

Note: Number of students in each treatment (F: frequent feedback; I: infrequent feedback) grouped by country (Brazil and Spain).

Table II

Experimental Design (House-Money Effect)

Subject Type	Treatment IR	Treatment C
Students from Brazil	24	33
Students from Spain	32	33

Note: Number of students in each treatment (IR: isolated results; C: cumulative results) grouped by country (Brazil and Spain).

Table III

Descriptive Statistics

Country	Treatment	# Students	% Men	Avg. Age	Avg. Bet
Brazil	F	24	50.0%	24.08	40.10
	I	28	57.1%	25.64	55.38
	C	33	75.8%	21.36	44.45
Spain	F	32	56.3%	21.59	54.42
	I	32	37.5%	22.09	66.02
	C	33	54.5%	21.82	47.24

Note: Descriptive statistics given for each treatment (F: frequent feedback; I: infrequent feedback; C: cumulative results). The Table provides the number of subjects in each group (# Students), the percentage of men (% Men), the average age of the students (Avg. Age), and the average bet as a percentage over the total amount available for the subject (Avg. Bet).

Table IV

Treatments F, I and C

	Treatment F	Treatment I	Treatment C	Mann-Whitney z	
				F vs. I	F vs. C
Rounds 1-3	45.9 (30.9)	55.7 (28.1)	42.8 (27.5)	-3.59 [0.000]	0.64 [0.520]
Rounds 4-6	45.3 (34.6)	58.1 (28.4)	41.9 (29.9)	-3.96 [0.000]	0.48 [0.634]
Rounds 7-9	46.8 (35.5)	62.6 (30.1)	48.2 (30.4)	-4.33 [0.000]	-0.91 [0.362]
Rounds 10-12	55.2 (36.6)	67.8 (29.8)	50.5 (34.6)	-3.15 [0.002]	1.18 [0.237]
Rounds 1-12	**48.3 (34.6)**	**61.1 (29.4)**	**45.8 (30.9)**	**-7.49 [0.000]**	**0.71 [0.480]**

Note: Columns 1-3 summarize student's betting behavior over rounds. Standard deviations are provided in parentheses and p-values in brackets. Columns 4-5 summarize Mann-Whitney tests of the differences in behavior across treatment type.

Table V

Treatments grouped by sex

Rounds 1-12	Women	Men	Mann-Whitney z
Treatment F	46.6 (32.0)	49.8 (36.7)	-0.57 [0.570]
Treatment I	59.4 (25.9)	62.9 (32.9)	2.52 [0.012]
Treatment C	41.7 (26.2)	48.1 (32.9)	-2.33 [0.020]

Note: Columns 1-2 summarize student's betting behavior over treatments, grouped by sex. Standard deviations are provided in parentheses and p-values in brackets. Column 3 summarizes Mann-Whitney tests of the differences in behavior across sex type.

Table VI

Treatments F and I grouped by age

Rounds 1-12	Age <= 23	Age > 23	Mann-Whitney z
Treatment F	50.6 (35.0)	40.7 (32.1)	-2.98 [0.003]
Treatment I	62.8 (28.9)	59.0 (32.9)	-1.24 [0.216]
Treatment C	46.0 (31.1)	46.3 (30.9)	0.10 [0.923]

Note: Columns 1-2 summarize student's betting behavior over treatments, grouped by age. Standard deviations are provided in parentheses and p-values in brackets. Column 3 summarizes Mann-Whitney tests of the differences in behavior across age groups.

Table VII

Treatments F and I grouped by country

Rounds 1-12	Brazil	Spain	Mann-Whitney z
Treatment F	48.7 (36.1)	54.4 (35.0)	2.56 [0.011]
Treatment I	58.1 (28.5)	66.0 (29.9)	3.97 [0.000]
Treatment C	45.5 (31.0)	46.5 (29.3)	0.49 [0.625]

Note: Columns 1-2 summarize student's betting behavior over treatments, grouped by country. Standard deviations are provided in parentheses and p-values in brackets. Column 3 summarizes Mann-Whitney tests of the differences in behavior across country groups.

Table VIII

Treatments F and I grouped previous gain or loss

Rounds 1-12	After Loss	After Gain	Mann-Whitney z
Treatment F	52.2 (35.0)	39.5 (33.6)	-4.32 [0.000]
Treatment I	61.2 (29.7)	66.1 (32.7)	2.65 [0.008]
Treatment C	53.1 (31.5)	43.5 (31.5)	5.09 [0.000]

Note: Columns 1-2 summarize student's betting behavior over treatments, grouped by previous result. Standard deviations are provided in parentheses and p-values in brackets. Column 3 summarizes Mann-Whitney tests of the differences in behavior across previous result groups.

Table IX

Regression Results

Variable	Specification	
	F and I	F and C
Constant	55.13 [0.000]	41.80 [0.000]
Country S	10.40 [0.000]	4.94 [0.050]
Treatment F	-16.87 [0.000]	-3.68 [0.182]
Country S*Treatment F	4.36 [0.227]	9.83 [0.009]
F stat	36.66	10.35
R2	7.34%	2.08%
N	1392	1464

Note: Standard deviations are provided in parentheses and p-values in brackets. The dependent variable is the individual bet. "Brazil" is the omitted subject category, and therefore represents the baseline group. Country S (Treatment F) is the country (treatment) indicator variable that equals 1 if the subject was a Spanish student (in Treatment F), 0 otherwise. Country S*Treatment F is the country indicator variable interacted with the frequent feedback treatment variable. P-values of each regression coefficient are in brackets. The F-statistic, R^2 and the number of observations, N, are also provided.

Table X

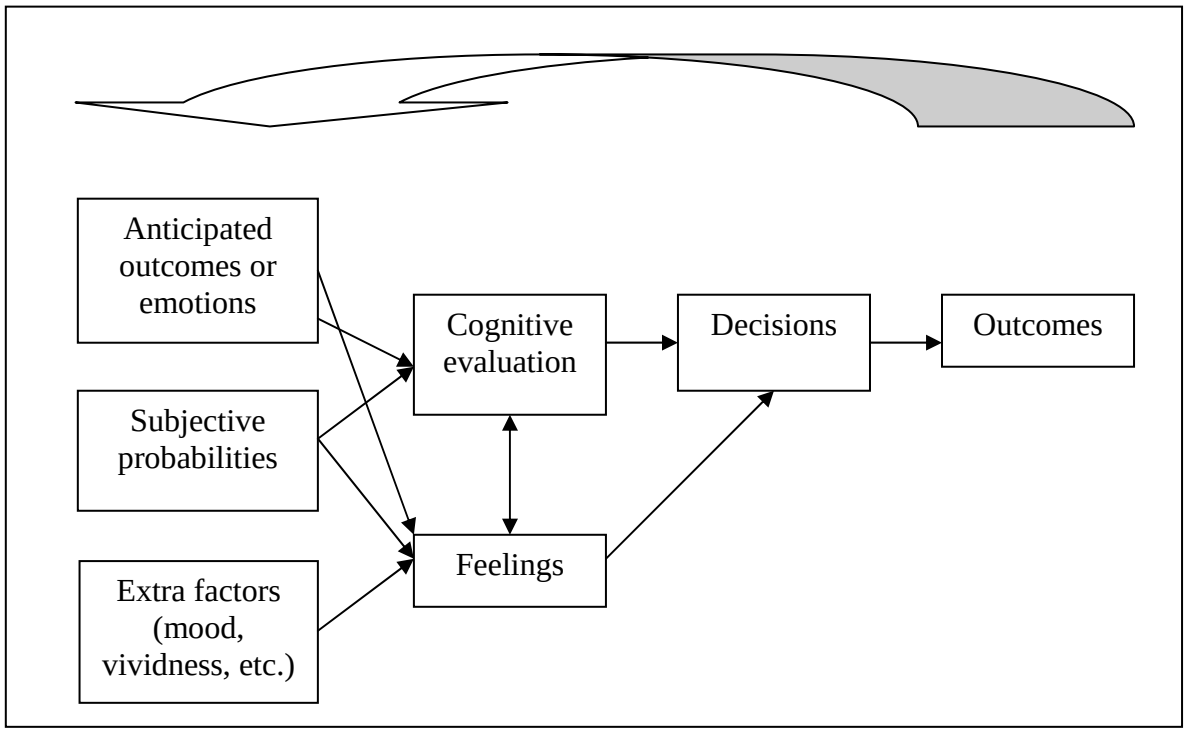
Regression Results

Variable	Specification	
	F and I	F and C
Constant	60.852 [0.000]	52.084 [0.000]
Prior Gain	0.91 [0.747]	-22.68 [0.000]
Treatment F	-9.88 [0.000]	-1.17 [0.619]
Prior Gain*Treatment F	-15.33 [0.000]	8.19 [0.048]
F stat	25.04	28.47
R2	6.00%	5.58%
N	1276	1342

Note: Standard deviations are provided in parentheses and p-values in brackets. The dependent variable is the individual bet. "Previous Loss" is the omitted subject category, and therefore represents the baseline group. Prior Gain (Treatment F) is the win (treatment) indicator variable that equals 1 if the subject won in the previous round (in Treatment F), 0 otherwise. Prior Gain*Treatment F is the win indicator variable interacted with the frequent feedback treatment variable. P-values of each regression coefficient are in brackets. The F-statistic, R^2 and the number of observations N are also provided.

Figure I

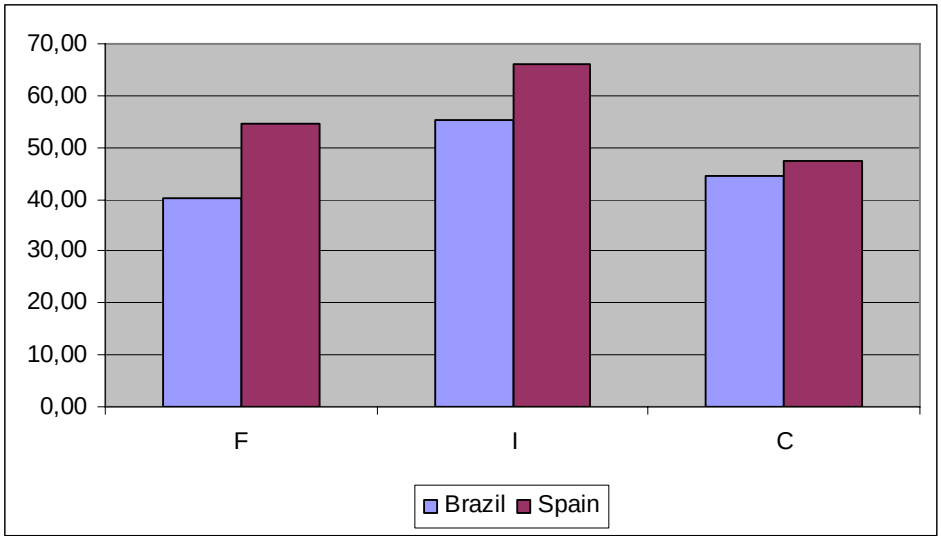
Risk as Feelings framework



Note: Adapted from Lucey and Dowling, 2005.

Figure II

Average Bets



Note: Average bets given by the percentage invested over the total amount available, grouped by country (Brazil and Spain) and treatment (F – frequent feedback; I – infrequent feedback; C – cumulative results).

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