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Keywords:

Tail events, trading institutions, experimental finance, emotions and risk

JEL codes:

C91, C92, G41, D91

Risk-Taking and Tail Events Across Trading Institutions[#]

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Abstract

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1. INTRODUCTION

Negative tail events, although infrequent, can cause dramatic financial losses (e.g., Taleb, 2007; Shiller, 2015; Aliber and Kindleberger, 2017), as recently exemplified by the financial markets bust following pandemic news in March 2020. How do financial decision makers cope with such dramatic events? In an experiment framed as an individual investment task, Corgnet, Cornand and

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Hanaki (2020; CCH henceforth) study investors' reactions to negative tail events. They show that investors decreased their bids after observing tail events without incurring tail losses because it increased the posterior probability of observing such an event. By contrast, investors who suffered tail losses increased their subsequent bids, which was explained by risk-seeking attitudes in the loss domain. Under prospect theory, investors incurring tail losses become risk-seeking because they suddenly enter the loss domain (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) and this effect more than offsets the increase in the updated probability of occurrence of tail events (CCH).

Moreover, recording investors' electrodermal activity and eliciting their personality traits, CCH show that reactions to tail events are linked to specific negative emotional responses such as anger and fear. The role of emotions in the study of tail events is critical because, by definition, their occurrence is rare, thus triggering surprise and a strong emotional response (see Joffily and Coricelli, 2013). In particular, CCH show that the increase in bids following tail losses is exacerbated by anger in line with the appraisal theory of emotions (Lazarus, 1991; Lerner and Keltner, 2001; Lerner et al., 2015).

While the results of CCH apply to individual decision making, negative tail risk is an essential feature of financial markets that has been used, for example, to account for the equity premium puzzle (e.g., Harvey and Siddique, 2000; Barro, 2006, 2009; Bollerslev and Todorov, 2011; Gabaix, 2012; Kelly and Jiang, 2014; Bollerslev et al., 2015; Lemperiere et al., 2017; Andersen et al., 2019). Our aim is thus to study tail events in a market, where investors' decisions are interdependent. In particular, we want to assess whether investors' reactions to tail events and tail losses are attenuated or amplified in a market setting. To our knowledge, no previous works have studied tail events in experimental markets and compared trading institutions in the presence of tail events. Yet, recent experimental works have compared risk-taking in markets with the Becker, DeGroot and Marschak (1964) mechanism (BDM) in the absence of tail events (Mengel and Peeters, 2020).¹

¹ A related literature compares actual bids in auction experiments with the risk-neutral Nash equilibrium prediction. These works report overbidding in second-price common-value auctions (see Kagel and Levin, 2011 for a review). This literature differs from our work because it does not directly compare a BDM with a market institution.

To compare trading institutions, we employ a between-subject experimental design with three treatments: *baseline*, *feedback* and *market*. We design these treatments so that bids should not differ across them in normal times while allowing us to study potential differences in the reaction of investors to tail events across institutions. Inspired from CCH, the *baseline* features an individual investment task, in which investors used a standard BDM mechanism to bid over 300 periods for a financial asset that delivered a small positive reward (either 10¢, 20¢, 30¢, 40¢ or 50¢) in more than 99% of the cases and a large loss (1,000 ¢) otherwise. The loss event was very unlikely (0.66%) but substantial enough to possibly wipe out any accumulated earnings. The *feedback* treatment was the same as the *baseline* except that investors could observe the bids of others in the previous period. The *feedback* treatment was used as a control treatment that can be directly compared to the *market* treatment as both give investors the same information about others' bids. The *market* treatment thus only differs from *feedback* in the institution used to purchase the asset. In the *market* treatment, we replace the uniform draw of the BDM mechanism by a uniform draw over the bids of the other participants as in a random n th-price auction (see Shogren et al., 2001), thus endogenizing the price of the asset.²

We designed the treatments to be as similar as possible so that we do not expect bids to significantly differ across institutions in normal times (*Hypothesis 1*). In the case in which tail events occur, we expect to replicate the results of CCH, namely that *i*) investors who observe but do not suffer a tail event are more likely to reduce their bids afterwards, *ii*) investors who suffer a tail event are more likely to increase their subsequent bids. We refer to these predictions as *Hypothesis 2*. According to CCH, emotions play a key role in accounting for investors' reactions to tail events. Interestingly, these emotions are likely to be affected by the interdependence of investors' decisions, which is inherent to the market treatment. In particular, compared to individual decision making, a market institution is characterized by a social context in which investors observe information about others' bids. We refer to this feature of the market as the *social information* dimension, which we can isolate in our experimental design by comparing the *baseline* and *feedback* treatments. This social dimension might exacerbate emotions and thus investors' reactions to tail events. This follows from the fact that emotions serve a social purpose and are

² In each treatment, investors were matched in groups of six with the exception of four groups in the *baseline* and one in the *market* treatments which had four and five investors, respectively.

thought to have evolved to convey critical information in a social context (Keltner and Haidt, 1999; Cacioppo et al., 2000; Cosmides and Tooby, 2000; Fischer and Manstead, 2008; Frith, 2009; Hareli and Hess, 2012; Lehrner and Yehuda, 2018). However, we cannot a priori identify the extent to which the social information dimension of markets can impact the two relevant emotions associated with negative tail events, anger and fear (see CCH). We thus cannot state a hypothesis regarding the effect of social information in the presence of tail events.

Another key feature of markets compared to individual decision making is the *competition* dimension, which we can isolate in our experimental design by comparing the *feedback* and *market* treatments. Following the appraisal theory of emotions (Quigley and Tedeschi, 1996; Lerner and Keltner, 2001; Lerner et al., 2015), we can identify how competition might affect anger, which is one of the two relevant emotions associated with negative tail events (see CCH). Competition is likely to exacerbate anger because an emotion is more likely to be evaluated as anger if another person can be partly held responsible for the negative outcome (Quigley and Tedeschi, 1996; Lerner et al., 2015). Attributing one's losses to the behavior of other investors is possible in the case of markets in which, unlike individual investment choices, decisions are interdependent. We thus expect that tail losses will trigger a stronger anger response in the *market* treatment than in the other treatments. Because anger has been showed to trigger risk-seeking attitudes (CCH; Lerner and Keltner, 2001; Fessler et al., 2004; Elliot et al., 2013; Lerner et al., 2015; Engelmann and Hare, 2018), we expect a more pronounced increase in bids after tail losses in the market treatment than in the other two treatments. We refer to this prediction as the *angry-market conjecture*.

Our experimental findings confirm our two hypotheses. In line with *Hypothesis 1*, we found no difference across treatments in normal times. In line with *Hypothesis 2*, we replicated the tail events results of CCH to the case of markets. However, treatments differed in response to tail losses. In line with the *angry-market conjecture*, bids were more likely to increase in response to tail losses in the *market* treatment compared to the *baseline*. We also report suggestive evidence that the increase in bids after tail losses might be explained by exacerbated anger in the market treatment. Investors were also more likely to increase their bids after tail losses in the *feedback* treatment compared to the *baseline* although this difference was not statistically significant.

2. RELATED LITERATURE

In this review of the literature, we focus on studies assessing how the two main features of the market institution, which we referred to as *social information* and *competition*, might impact the behavior of decision makers in normal times. We will highlight why the effects identified in the literature are unlikely to apply to our setup. We then briefly review the literature on tail events and emotions in financial markets.

2.1. Social information and competition

Regarding the *social information* dimension, a rapidly growing number of experiments have shown evidence of peer effects in risk-taking in financial decisions.³ Part of this literature focuses on rank incentives, which are non-monetary incentives related to one's relative position. For example, Kirchler et al., (2018a) show that rank incentives increase risk-taking among underperforming professionals, but not among students, when they invest for themselves.⁴ Corazzini and Greiner (2007) do not find any effect of others' information in sequential risky decisions in line with Kirchler et al., (2018a) results with students. Lindner et al., (2019) extend the analysis of Kirchler et al., (2018a) on rank incentives by separating the effects of self-image and status motives on risk-taking. They show that risk-taking among students is higher when the winner or the loser is publicly announced. However, they do not observe these effects for the case of professionals. Finally, they observe that underperforming investors take more risks than outperformers when rankings are displayed and the winner or loser is publicly announced. In the same vein, Kuziemko et al., (2014) show that individuals take more risks when they are at the very bottom of a performance ranking because of a phenomenon they refer to as 'last-place aversion'. Dijk et al., (2014) and Fafchamps et al., (2015) also find that underperformers take more risks to catch up with top performers. Schwerter (2013) finds that portfolio choices depend on a social reference point such as another participant's income. Lahno and Serra-Garcia (2015) demonstrate that both social learning and income comparisons play an important role in understanding peer effects, where social learning occurs when one obtains critical information about the value of an investment by observing others' decisions.⁵ In a portfolio choice experiment, Gortner and van der Weele (2019) find that peer information lowers within-group variation in peer earnings and

³ See Trautmann and Vieider (2012) for an overview of these effects in decisions under risk.

⁴ Kirchler et al., (2018b) show that the same result is obtained when they invest on behalf of third parties.

⁵ Bault et al., (2011) and Frydman (2015) present similar results along with neurological evidence.

increases diversification, thus reducing risk-taking. Beyond individual portfolio choices, Schoenberg and Haruvy (2012) study the impact of social information in an experimental asset market. They find that observing the earnings of the top performer increases the likelihood of bubbles. In our experimental design, the previously-studied peer effects are likely to be weak because we do not provide information about peers' earnings and rankings. Because we will not display other participants' wealth, we shut down the channel of imitating high performers' behavior. Yet, we could observe a certain form of conformist behavior leading investors to place bids that are over time closer to the median or the modal choice of the previous period (see Gortner and van der Weele, 2019). However, it is unclear how this behavior would affect investors' risk-taking.

Previous works have also used field data to assess peer effects in financial decisions such as stock market participation (Hong et al., 2004; Kaustia and Knüpfer, 2012) and trading decisions (Kelly et al., 2000; Hong et al., 2005; Shive, 2010; Hackethal et al., 2014). For example, Heimer and Simon (2012) provide evidence that social interactions contribute to the use of active investment strategies. Using a high-stakes field experiment conducted with a brokerage firm, Bursztyn et al., (2014) study two different channels by which peer effects might operate: social learning and social utility, which is the utility one gets from holding the same asset as others. Both social learning and social utility channels are found to have statistically significant effects on investment decisions. However, these peer effects are unlikely to apply in our setup. Social learning is limited in our design because all the information about the asset is publicly available to investors. In addition, our investment decision is simple and does not require uncovering the solution to a complex optimization problem. Participants are thus less likely to imitate others' decisions than in a complex investment task with multiple assets (Gortner and van der Weele, 2019; Apesteguia et al., 2020). Social utility is also limited because the experiment is anonymous and no one can identify who has been buying the asset or not. Furthermore, we prevented any form of social interaction between participants thus limiting further the social utility channel underlying peer effects.

Regarding the *competition* dimension, the literature is scant as few papers directly compare a market mechanism with an individual investment task. An exception is the experimental study of Mengel and Peeters (2020) that aims at studying the causal impact of markets on risk-taking. They compared a market treatment implemented using a call auction with a non-market treatment

implemented using a BDM. In both treatments, people could trade two assets that varied in their riskiness. When the bids and asks of other participants were displayed in both treatments, Mengel and Peeters report that the risk premium on the riskier asset was larger in the market than in the non-market treatment thus suggesting markets reduce risk-taking.

2.2. Tail events

The literature on tail risk has mainly concentrated on insurance against large-scale risk. Krawczyk et al., (2017) focus on catastrophic risk and show no evidence for peer effects on insurance take-up. In contrast, they provide support for the prediction that people underweight others' relevant information in their own insurance decisions. Gallagher (2014) shows that when a county is hit by a flood, residents in neighboring counties increase their insurance take-up. Friedl et al., (2014) also identify peer effects in insurance purchases in a laboratory experiment. In particular, they find that people are less likely to purchase insurance when risks are correlated. Our work extends the tail-risk literature by studying investors' reaction to tail losses instead of the ex-ante valuation of tail risk (e.g., Harvey and Siddique, 2000; Barro, 2006, 2009; Bollerslev and Todorov, 2011; Gabaix, 2012; Kelly and Jiang, 2014; Bollerslev et al., 2015; Lemperiere et al., 2017). We also extend previous works on tail risk that have focused on individual decisions by considering a market setup (e.g., Kunreuther et al., 1978; Kunreuther et al., 2009; Kunreuther and Pauly, 2018; Payzan-LeNestour, 2018; CCH). To our knowledge, ours is the first experimental study of tail events in markets.

2.3. Emotions and financial decisions

Numerous works have emphasized how emotions can alter expected utility calculations, as put forth by the proponents of the 'risk-as-feelings' hypothesis (Loewenstein et al., 2001) or the 'affect heuristic' (Slovic et al., 2007). In the finance literature, scholars have increasingly recognized the relevance of emotions in individual investment decisions as well as in markets. In the case of markets, Andrade et al., (2016) have shown that inducing certain emotions, like excitement, can increase the magnitude of bubbles in experimental markets. In a similar setup, Breaban and Noussair (2018) assessing traders' emotional state using face-reading software have found that price levels were lower (higher) when people entered the market in a more fearful (happier) emotional state. The literature on individual financial decisions has emphasized the negative role of emotions and the fact that upset traders might engage in excessive risk taking to recover their

losses (see e.g., Lo and Repin, 2002; Lo et al., 2005; Shefrin, 2000; Shefrin, 2008; Shefrin, 2010; Lo, 2017). These works discuss the basic mechanisms along with historical examples. An illustrative story is the one of Nick Leeson who increased his risk exposure in the face of substantial losses incurred while betting on the recovery of the Japanese stock market after the Kobe earthquake of 1995. This behavior ultimately led to the bankruptcy of Barings Bank (Lo, 2017). Ours is the first work showing how the use of a market institution impacts risk taking in the face of tail events and large losses.

3. DESIGN

We designed an incentivized experiment that allows us to observe participants' reaction to non-hypothetical tail events across trading institutions. The experiment consisted in two parts. In Part 1, participants earned money by responding to a survey regarding various psychological and cognitive characteristics (Section 3.3). In Part 2, participants played a repeated investment task under three treatments in a between-subject design (*baseline*, *feedback* and *market* treatments, see Sections 3.1 and 3.2). We design three treatments so as to disentangle the effect of *social information* and *competition* on investors' bidding behavior. The protocol is described in Section 3.4.

3.1. Investment Task (*baseline*)

The design of the investment task of the *baseline* is taken from CCH.⁶ We elicited participants' willingness to pay for an asset involving a tail risk using the BDM method. At the beginning of each of the 300 periods, participants had to bid for a financial asset that delivered a small positive reward (either 10¢, 20¢, 30¢, 40¢ or 50¢) in 99.33% of the cases and a very large loss (1,000¢) otherwise. Thus, the expected value of the asset each period was 23.1¢. The bid (any integer between 0 and 50) in each period was compared to a price (also an integer) randomly drawn from a uniform distribution between 1 and 50. If the bid of a participant was greater than or equal to the price, they paid the price and purchased the asset, otherwise they did not purchase the asset.

At the end of each period, a feedback screen informed participants about the reward of the financial asset, the earnings for the current period as well as cumulated earnings, which were equal to the

⁶ For the sake of comparability between *baseline*, *feedback* and *market* treatments (see Section 3.2), in contrast to CCH, we did not record physiological data.

initial endowment, composed of Part 1 fixed wage (1,200¢), plus the gains and losses from buying the asset in previous periods.

The tail event was highly unlikely (0.67%) but triggered losses which were as large as 83.3% of Part 1 fixed wage.⁷ To make the monetary loss associated with the tail event especially meaningful, we asked participants to invest the fixed wage they earned in Part 1 during the investment task. In addition, participants were given a loan of 1,000¢ for liquidity reasons, which had to be repaid at the end of the experiment (as in Plott and Sunder, 1982, 1988). This loan ensured that participants would have enough cash to bid for the asset even after tail losses had been incurred, thus allowing us to study investors' reaction to tail events while abstracting from potential liquidity constraints. However, if the current wealth of participants (including the loan) was no longer sufficient to repay the loan, they would go bankrupt. Participants would typically go bankrupt when suffering the tail event twice. In that case, participants were not able to purchase the asset anymore and had to wait until the end of the session (while provided with Internet access). Investors who went bankrupt lost the fixed wage they earned on Part 1 and were only rewarded a 5-euro show-up fee.⁸

Because participants can lose all their endowment when a tail event occurs, participants might believe the experimenter is purposefully engineering the draws to ensure tail events would occur, thus reducing participants' earnings and lowering the cost of the experiment. To make it clear to the participants that the sequence of draws was random and thus unpredictable, we adopted the following hand-run procedure. Before participants read the instructions, we showed them a transparent box containing 302 tokens of 6 different colors, each of which was associated with a potential return from the asset (blue token = 10¢, red token = 20¢, orange token = 30¢, green token = 40¢, purple token = 50¢, yellow token = -1,000¢). There were 60 tokens of each color, except for two yellow tokens. Once everyone had seen the tokens, we told participants we were taking a picture of the box that would be displayed on their screens during the experiment.⁹ By observing this picture during the experiment, participants could form an estimate of the frequency of

⁷ The tradeoff in selecting the probability of the tail event occurring was that it had to be high enough to ensure most participants would experience it while being rare enough to be qualified as a tail event. Following CCH, we opted for picking a number below 1% (0.67%), which is smaller than typical experiments studying the pricing of tail risk (e.g., Barron and Erev, 2003; Hertwig et al., 2004; Erev, 2007; Erev et al., 2017).

⁸ There is limited liability in our experiment because bankrupt participants did not repay the loan in full. On average, they repaid about 73.4% of the loan.

⁹ Actually, a photograph of the box was taken prior to the first experimental session so that the picture displayed on participants' screens was exactly the same in all sessions.

occurrence of each token. The distribution of tokens was thus not fully known by participants so as to allow for learning during the experiment.

Next, we explained that 15 participants, called pickers, had been randomly selected in 15 previous experimental sessions (see CCH). Each picker had been asked to put all the tokens of the same transparent box in an opaque bag and to draw the tokens with replacement. The picker had to enter the token draws on a computer and on a separate sheet of paper. This sheet of paper was signed by the picker upon the completion of the task, and shown to all participants at the end of the experiment so as to further ensure the credibility of the procedure. The picker did not know the instructions of the investment task.¹⁰ Pickers were paid a fixed amount of 15 euros, but incurred a 5-euro penalty if they had not completed their task within 1 hour.¹¹ During this task, one of the experimenters closely monitored the picker to make sure the procedure was followed.

At the beginning of each session, a participant was randomly selected to choose a number between 1 and 15 in order to select the sequence of draws from the 15 previous experimental sessions. For each treatment, we ensured that a sequence of draws could not be selected in more than one session, thus facilitating comparability across treatments.

3.2. Treatment conditions (*feedback* and *market*)

In addition to the *baseline* described above, we implemented a *feedback* treatment and a *market* treatment. The aim of the *feedback* treatment was to capture the potential effect of *social information*. In the *feedback* treatment, participants could observe the individual bids set by all the other investors in the group after they made their decision and before receiving any feedback regarding their earnings in a period. The only feature that differed between the *baseline* and *feedback* treatments was the additional feedback screen displayed to participants.

In the *market* treatment, the same feedback screen (information on others' bids) as in the *feedback* treatment was displayed. The only difference between the *market* and *feedback* treatments was the pricing mechanism. In the *market* treatment, the uniform random draw over $[1, 50]$ of the BDM mechanism was replaced by a uniform random draw over the bids set by the participants similarly

¹⁰ The participants knew the picker did not know the instructions for the investment task.

¹¹ This penalty was never implemented.

to a random n th-price auction.^{12,13} The random n th-price auction resembles a BDM mechanism because both the price and the number of buyers will vary across iterations. According to Shogren et al., (2001), similarly to the BDM mechanism, truth-telling is the dominant strategy in a private value n th-price auction.¹⁴ Comparing the *feedback* treatment to the *market* treatment allows us to capture the impact of *competition*.

An English translation of the instructions for the investment task for each of the three treatments is reported in Appendix A.

3.3. Survey

We collected extensive individual information regarding risk, loss and ambiguity attitudes as well as personality traits, cognitive skills and demographic data. An English translation of the 8 blocks of tests that we performed, as well as descriptive statistics are reported in Appendix A.

In particular, we elicited the temperament (emotional trait, henceforth) of our participants, which allows us to assess a person's proneness to emotions such as anger which was found by CCH to be key in understanding investors' reactions to tail losses. We used the reactance scale (Hong and Faedda, 1996) to measure trait anger of our participants (see Appendix A, Block 5).¹⁵ These test scores give us valuable information regarding whether a participant may experience anger after a tail event occurs because there is a close connection between personality traits and emotions as is put forth by Shiner (2018, p. 62): "(...) temperament-based personality traits are the clearest manifestation of individual differences in emotion (...)". An emotional trait can both increase one's attention to an emotional stimulus as well as lower the physiological threshold above which the emotion is expressed (Shackman et al., 2018). Thus, a person with an anger-prone emotional trait

¹² The reason for not using the k^{th} price auction for the *market* treatment (with the number of assets being sold to be $k-1^{\text{th}}$ highest bid) is to avoid making the number of assets being sold constant across periods. Note that the number of assets bought in the *baseline* is not fixed. By picking one bid at random, we introduce randomness in the number of assets being sold, with the maximum number of sold assets being equal to the number of players in the market minus one, and the minimum being zero.

¹³ Although the *market* treatment was made as comparable as possible to the *feedback* treatment, two adjustments were made with respect to the BDM mechanism used in the *baseline* and *feedback* treatments. First, the condition for a participant to buy the lottery was conditional on setting a price strictly higher than the selected price. Second, a participant could only enter a price between 1 and 50 (rather than between 0 and 50). This ensured that a participant could always decide not to participate in the auction by setting a price equal to one.

¹⁴ Because observed subjects' risk preferences are heterogeneous and imperfectly observed, we consider that our market setup is not a common but a private value auction.

¹⁵ This measure is an alternative to the anger facet of personality of the HEXACO scale (Ashton and Lee, 2009). We opted for this scale because it includes a larger number of items and has been shown to be psychometrically reliable (Cronbach-alpha = 0.714 in our sample).

is more likely to exhibit anger when facing a negative event (Rothbart, 2011; Chen and Schmidt, 2015; Shiner, 2018).¹⁶

Another important measure relates to eliciting risk-seeking in the loss domain by adapting the standard Holt and Laury (2002) elicitation task to the case of negative payouts (see Appendix A, Block 7). We measure risk-seeking in the loss domain by counting the number of times a person chose the risky option instead of the safe option.

3.4. Protocol

Between May and June 2019, we invited a total of 213 participants from a participant pool of more than 2,500 students at a major university, where 42.2% of the participants were males and their average age was 22.1 years old. All the tasks were computerized and the duration of the survey was about half an hour. We conducted a total of 15 sessions (see Table 1).¹⁷

Table 1. Treatment sessions

Treatment	Number of sessions	Number of participants	Composition of groups	Sequences of draws
Baseline	6	70	9 groups of 6 4 groups of 4 ¹⁸	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Feedback	5	72	12 groups of 6	2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15
Market	4	71	11 groups of 6 1 group of 5	3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15

Among the 15 sessions we conducted, we had 37 groups of 4, 5 or 6 investors. We had an average of 2.16 tail events per group including two groups without any tail event, ten with one tail event, ten with two tail events, six with three and nine with four. This empirical distribution is consistent with random draws because there were exactly two yellow tokens in the bag of 300 tokens. The dynamics of asset returns in each sequence are reported in Appendix B.

¹⁶ It is also important to note that emotional traits, especially in relation to anger, are shaped early in life and tend to be stable across time and contexts (e.g., Buss and Plomin, 2014; Shiner, 2018).

¹⁷ In the last column, we report the sequence of draws (for the 300 periods). These sequences are taken from the 15 sessions in CCH. We do not see major differences in the sequences of draws across treatments because we coded the software so that, for a given treatment, a given sequence could not be chosen twice.

¹⁸ The number of participants in a given group was irrelevant in the *baseline* because only the information about one's own bids were shown on the screen.

Sessions lasted for 3.5 hours on average. Average earnings were 34 euros, including a 5 euros show-up fee. The baseline design of the experiment reported in this paper has been approved by the IRB of INSERM (#18-493) in May 2018. The study was also approved by the local ethical committee.

4. RESULTS

We test our two hypotheses in Sections 4.1 and 4.2 and evaluate the role of anger in Section 4.3.

4.1. Treatment comparison in normal times (Hypothesis 1)

The average bid, defined at the group level, was equal to 25.48¢ in the *baseline* compared to 23.80¢ and 23.79¢ in the *feedback* and *market* treatments for the periods before the first occurrence of a tail event. As is shown in Table 2 (regression (1)), these differences are not statistically significant because the coefficients for ‘Market Dummy’ and ‘Feedback Dummy’ exhibit *p*-values larger than 0.10.¹⁹ These findings are in line with *Hypothesis 1*.

Table 2. Bids Across Treatments

Panel linear regressions with random effects and robust standard errors clustered at the individual levels in parentheses.

VARIABLE SAMPLE	Bids	
	No tail event (1)	At least one tail event (2)
Feedback Dummy	-0.161 (1.782)	2.274 (2.427)
Market Dummy	-1.392 (1.775)	4.380** (2.145)
Period	-0.006 (0.007)	-0.025*** (0.006)
Constant	25.358*** (0.990)	26.943*** (2.215)
Observations	5,008	6,092
Number of Groups	35	37

Robust standard errors in parentheses, group fixed effects included. *** *p*-value < 0.01, ** *p*-value < 0.05, * *p*-value < 0.1. Feedback (Market) Dummy takes value one if a participant is assigned to the *feedback* (*market*) treatment, and value zero otherwise.

¹⁹ The test of the difference between the coefficients associated with these two dummies reports a *p*-value = 0.561.

However, we report that, once a tail event has been observed, the average bids are 26.44% higher in the *market* treatment compared to the baseline (p -value = 0.041 for the ‘Market Dummy’ in regression (2), Cohen’s $d = 0.783$). Although, average bids are also 19.42% higher in the *feedback* treatment compared to the *baseline*, this difference is not statistically significant (p -value = 0.349 for the ‘Feedback Dummy’ in regression (2), Cohen’s $d = 0.510$).²⁰

These findings are illustrated in Figure 1 which shows that average bids levels are very similar across treatments in the beginning of the experiment, which is when tail events are unlikely to have happened. In the first 50 periods, only 15% of the groups observed a tail event compared to 95% in the end of the experiment. Not surprisingly, we observe that bids in the *market* treatment become higher than bids in the other two treatments as time passes.

Figure 1. Average bids per period (at the group level) across treatments along with 20-period moving averages.

²⁰ The test of the difference between the coefficients associated with the ‘Market Dummy’ and the ‘Feedback Dummy’ reports a p -value = 0.404.

4.2. Tail events and bids (Hypothesis 2)

In line with *Hypothesis 2*, we show in Table 3 that investors who did not buy the asset, thus observing a tail event without suffering tail losses, decreased their bids after a tail event compared to a no-tail event (see ‘Tail Event Dummy’ in regression (1)). The marginal effect associated with the ‘Tail Event Dummy’ is 7.11% (p -value = 0.004). In line with *Hypothesis 2*, we also show that investors who bought the asset and thus suffered tail losses when a tail event occurred, increased their bids after a tail event compared to a no-tail event (see ‘Tail Event Dummy’ in regressions (3) and (4)). The marginal effect associated with the ‘Tail Event Dummy’ is 9.89% [13.99%] in regression (3) [4] with p -values = 0.001 and 0.007.²¹ In regression (2), we observe that the variables ‘Feedback $\times$ Tail Event Dummy’ and ‘Market $\times$ Tail Event Dummy’ are not statistically significant so that any difference in the effect of the tail event dummy on the likelihood to decrease one’s own bid between the *baseline* and the other two treatments is not significant.²² However, regressions (5) and (6) show that the variable ‘Market $\times$ Tail Event Dummy’ is statistically significant (p -values = 0.051 and 0.024) whereas this is not the case for ‘Feedback $\times$ Tail Event Dummy’ (p -values = 0.537 and 0.149).²³ It follows that the inclination to increase one’s own bid following tail losses is significantly more pronounced in the *market* treatment than in the *baseline*. Testing the difference in coefficients for ‘Market $\times$ Tail Event Dummy’ and ‘Feedback $\times$ Tail Event Dummy’ leads to p -values equal to 0.189, 0.304 and 0.232 for regressions (2), (5) and (6). This implies that the more pronounced reaction to tail losses in the *market* treatment is not explained by the *competition* effect alone. It is thus the combination of the *competition* and the

²¹ Regression (4) differs from regression (3) because we focus our analysis on investors who scored above the median on our measurement of risk-seeking in the loss domain. This analysis is motivated by the fact that the increase in bids that follows tail losses has been shown to relate to risk-seeking in the loss domain (see CCH). Regression (6) also focuses the analysis on those who scored above the median on the measurement of risk-seeking in the loss domain.

²² In regression (2), the ‘Tail Event Dummy’ is not significant (p -value = 0.181) so that the decrease in bids after observing yet not suffering a tail event is not significant when focusing on the *baseline* only. In CCH, this effect is statistically significant although the associated marginal effect of 8.0% is close to the marginal effect of 5.9% for the ‘Tail Event Dummy’ in regression (2). Note that pooling the *baseline* and the *feedback* treatment, the p -value associated with the ‘Tail Event Dummy’ is 0.009 and the marginal effect is 8.4% with a coefficient estimate of 0.337 compared to 0.325 in CCH.

²³ In regression (5), the ‘Tail Event Dummy’ is not significant (p -value = 0.462) so that the increase in bids after suffering tail losses is not significant when focusing on the *baseline* only. In CCH, this effect is statistically significant and the associated marginal effect of 9.3% compared to 3.5% for the ‘Tail Event Dummy’ in regression (5). Note that pooling the *baseline* and the *feedback* treatment, the p -value associated with the ‘Tail Event Dummy’ is 0.103 and the marginal effect is 5.9% with a coefficient estimate of 0.227 compared to 0.392 in CCH.

social information effects that explains the substantial increase in bids after tail losses in the *market* treatment.

Table 3. Decrease and Increase in Bids and Tail Events

Panel probit regressions with random effects and robust standard errors clustered at the individual levels in parentheses, session fixed effects included. The dependent variable ‘DOWN DUMMY’ (‘UP DUMMY’) takes value one if an investor decreased (increased) his or her bid compared to the previous period.

VARIABLE	DOWN DUMMY		UP DUMMY			
SAMPLE	Investors who did not buy the asset in previous period		Investors bought the asset in previous period			
	(1)	(2)	(3)	(4) [*]	(5)	(6) [*]
Tail Event Dummy	0.266*** (0.093)	0.226 (0.169)	0.374*** (0.118)	0.526*** (0.194)	0.140 (0.184)	-0.008 (0.276)
Feedback Dummy	-0.191 (0.258)	-0.192 (0.258)	-0.311 (0.233)	0.196*** (0.006)	-0.313 (0.234)	0.189*** (0.010)
Market Dummy	-0.189 (0.171)	-0.188 (0.172)	-0.207 (0.191)	-0.224 (0.184)	-0.213 (0.192)	-0.235 (0.187)
Feedback × Tail Event Dummy	-	0.213 (0.245)	-	-	0.168 (0.272)	0.592 (0.410)
Market × Tail Event Dummy	-	-0.049 (0.210)	-	-	0.559* (0.287)	1.040** (0.459)
Period	-0.0004* (0.002)	-0.0004* (0.002)	-0.004* (0.002)	-0.0003 (0.0004)	-0.003 (0.024)	-0.0003 (0.0004)
Number of Tail Events	-0.0001 (0.024)	-0.0001 (0.024)	-0.009 (0.024)	-0.021 (0.038)	-0.008 (0.024)	-0.022 (0.038)
Constant	-0.525*** (0.120)	-0.524*** (0.121)	-0.533*** (0.120)	-0.456*** (0.047)	-0.531*** (0.121)	- 0.450*** (0.047)
Observations	34,159	34,159	25,456	7,854	25,456	7,854
Number of Groups	213	213	213	64	213	64

Robust standard errors in parentheses, session fixed effects included. *** p -value < 0.01, ** p -value < 0.05, * p -value < 0.1

^{*} Regressions (4) and (6) are performed for those investors who scored above the median on our measurement of risk-seeking in the loss domain.

4.3. Angry-market conjecture

Previous results show a difference in the reaction to tail losses in the *market* treatment compared to the *baseline*. Because the emotion of anger plays a key role in understanding investors’ reactions to tail losses (CCH), we assess whether anger motives can explain the increase in bids after tail

losses in the *market* treatment. To that end, we measure *trait anger* using the 11-item reactance scale (Hong and Faedda, 1996; Dillard and Meijnders, 2002; Dillard and Shen, 2005; Quick and Stephenson, 2007a, 2007b, 2008; Rains and Turner, 2007; Quick and Kim, 2009; Rains, 2013; Sittenthaler et al., 2015).

In Figure 2, we display the ‘UP DUMMY’, that is the proportion of times investors increased their bids, in the case in which a tail event occurred in the previous period or not. We observe that bids were twice more likely to go up after a tail event (46.7%) than after a no-tail event (23.3%) in the *market* treatment for those investors who bought the asset. If we consider people who are in the top quartile of the anger trait, bids were three times more likely to go up after a tail event (66.7%) than after a no-tail event (22.3%). In the *baseline [feedback]* treatments, people who were in the top quartile of the anger trait, increased their bids after a tail event 30.7% [40.0%] of the times compared to 16.5% [19.4%] for a no-tail event.

To assess the statistical significance of these results, we replicate regression (5) in Table 3 for different levels of *trait anger*: bottom quartile, below median, above median and top quartile. The variable ‘Market $\times$ Tail Event Dummy’ is positive and marginally significant when trait anger is above the median or in the top quartile while not being significant for those who score below the median or in the bottom quartile. The marginal effects associated with this variable are 6.36% and 12.22% (p -values = 0.593 and 0.257) for the investors scoring in the bottom quartile and below the median and are equal to 18.42% and 24.66% (p -values = 0.086 and 0.061) for those scoring above the median and in the top quartile. These results are even sharper when considering the case, as in Table 3 (regression (6)), of investors who score above the median on risk-seeking in the loss domain (see Table C1 in Appendix C). In that case, the marginal effects are 5.31% and 0.79% (p -values = 0.766 and 0.959) for the investors scoring in the bottom quartile and below the median and 36.65% and 43.21% (p -values = 0.023 and 0.045) for those scoring above the median and in the top quartile. Thus, in line with the *angry-market conjecture*, anger proneness of investors seems to drive the increase in bids after tail losses in the *market* treatment.

Figure 2. ‘UP DUMMY’ for investors who bought the asset in the previous period following a tail event or a no-tail event, for four levels of anger: bottom quartile, below median, above median and top quartile, across treatments. Upper 95% confidence intervals are shown.

The difference in the coefficients for ‘Market $\times$ Tail Event Dummy’ and ‘Feedback $\times$ Tail Event Dummy’ fails to reach statistical significance for the specification in Table 4 for anger-prone investors (p -values = 0.222 and 0.129 for regressions (3) and (4)). However, these differences are significant in the specification of Table C1 (p -values = 0.031 and 0.013 for regressions (3) and (4)).

Table 4. Increase in Bids, Tail Events and Anger

Panel probit regressions with random effects and robust standard errors clustered at the individual levels in parentheses, session fixed effects included.

VARIABLE	UP DUMMY			
	Investors bought the asset in previous period			
SAMPLE	Bottom Quartile (1)	Below Median (2)	Above Median (3)	Top Quartile (4)
Anger trait				
Tail Event Dummy	0.215 (0.320)	0.133 (0.279)	0.148 (0.244)	0.405 (0.356)
Feedback Dummy	0.136 (0.265)	-0.048 (0.158)	-0.561 (0.378)	-0.320 (0.335)
Market Dummy	-0.207 (0.324)	-0.327 (0.216)	0.280 (0.181)	0.543*** (0.015)
Feedback × Tail Event Dummy	-0.032 (0.569)	0.072 (0.477)	0.215 (0.332)	0.211 (0.499)
Market × Tail Event Dummy	0.233 (0.436)	0.452 (0.398)	0.709* (0.412)	1.004* (0.535)
Period	0.0002 (0.0003)	-0.0001 (0.0003)	-0.0007* (0.0004)	-0.0005 (0.0005)
Number of Tail Events	-0.024 (0.034)	-0.033 (0.032)	0.016 (0.036)	-0.030 (0.049)
Constant	-0.732*** (0.259)	-0.548*** (0.154)	-0.537*** (0.185)	-0.802*** (0.047)
Observations	9,104	11,994	13,462	6,705
Number of Groups	77	103	110	51

Robust standard errors in parentheses, session fixed effects included. *** p -value < 0.01, ** p -value < 0.05, * p -value < 0.1

It is worth noting that the variable ‘Feedback × Tail Event Dummy’ never appears to be significant in Tables 4 and C1. That is, for anger-prone investors, the *competition* effect rather than the *social information* effect seems to drive the increase in bids after tail losses in markets. Previous research has indeed shown that *competition* might trigger aggressive behavior (see Carré et al., 2009). In particular, anger seems to be prevalent in competitive settings in which one incurs losses (Donzella et al., 2000). The anger personality trait also seems to be associated with being more competitive (Buss and Perry, 1992). At the physiological level, the proponents of the *challenge hypothesis* (Wingfield et al., 1990; Archer, 2006) have highlighted a relationship between competitive

pressure and testosterone levels, which promote aggressive behavior. To understand the underlying mechanisms between *competition* and anger in the market treatment, we can appeal to the appraisal theory of emotions according to which anger tends to be the predominant emotional response when the occurrence of a negative event can partly be attributed to the behavior of others (Quigley and Tedeschi, 1996; Lerner and Keltner, 2001; Lerner et al., 2015). Because in the *market* treatment purchasing the asset and suffering tail losses is partly a consequence of others' decisions, this negative event can partly be attributed to the behavior of other investors. This differs from the *baseline* and *feedback* treatments in which others' bids do not directly impact one's likelihood of incurring tail losses.

5. CONCLUSION

We designed an experiment that allowed us to compare investors' reactions to tail events in a market compared to an individual investment task. We showed that, although investors' bidding behavior did not vary across treatments in normal times, the market exacerbated the increase in bids following tail losses. We posit that this might be due to the market institution exacerbating anger, thus promoting 'gambling for resurrection' in the face of negative tail events (Shefrin, 2000; Lo and Repin, 2002; Lo, 2017).

Our results appear to be consistent with the idea that markets foster emotional contagion in times of crises (Hatfield et al., 1993; Lux, 1995; Lynch, 2000; Shiller, 2015; Herrando and Constantinides, 2021). Interestingly, emotional contagion may be even more prevalent when we consider, unlike the present study, the social context of the marketplace. This social context is characterized by the availability of chat platforms and social networks in which participants share their opinions and sentiments about the market (see e.g., Shiller, 2000; Corgnet et al., 2020). The phenomenon of emotional contagion in markets might then justify the use of circuit breakers that allow investors to vent their anger when market values drop precipitously (e.g., Bushman, 2002; Xiao and Houser, 2005; Bolle et al., 2014; Dickinson and Masclet, 2015).

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Appendices

Appendix A: Instructions, screen and program

INSTRUCTIONS (on screen) (COMMON TO THE 3 TREATMENTS; UNLESS OTHERWISE STATED INSTRUCTIONS ARE FOR THE BASELINE TREATMENT)

Welcome.

Thank you for participating in this experiment.

Please turn off your phone. It is forbidden to talk to other participants throughout the session.

If at any time during the session you need help, press the red button on the left of your desk or raise your hand, we will immediately come to answer your questions in private.

Instructions

This experimental session is composed of two parts.

In the first part, you will perform a series of tests on the computer, for which you will receive a fix amount of 12 euros (1200 cents) and a variable payoff which will depend on your decisions in some of the tests.

The fix amount of 12 euros will be used in the second part of this experimental session as an initial endowment. The task you will complete in this second part will be described in details once the first part ends.

The variable payoffs that you will earn will be added to the total payoffs and will be paid in cash at the end of the experiment.

Instructions - PART 1

In this first part, you will answer 8 blocks of questions.

Please answer the following questions as best as you can.

Calculators, paper and pen are not allowed.

Block 1

Risk aversion in the gain domain

Following Holt and Laury (2002) we use the following risk aversion test.

For each line of the table presented on the following screen, indicate whether you prefer option A or option B.

Note that there is a total of 10 lines in the table, but only one line will be randomly selected to compute your payoffs. As all lines are equally likely to be selected for the computation of your payoffs, you should attribute the same importance to each of your decisions.

At the end of the experiment, a number between 1 and 10 will be randomly selected by the computer. This number will determine which line will be used to compute your payoffs. Your payoff for the selected line thus depends on the option that you will have chosen for this line: option A or option B. To finalize the computation of your payoffs, a second number between 1 and 10 will also be randomly selected by the computer.

- For example, if the first number selected by the computer is 3, this indicates that line 3 will be chosen for the computation of your payoffs. If for this line you have chosen option A, you will earn 2 euros if the second number randomly selected by the computer is 1, 2 or 3. If the second selected number is 4, 5, 6, 7, 8, 9 or 10, you will earn 1.60 euros.
- For example, if the first number selected by the computer is 5, this indicates that line 5 will be chosen for the computation of your payoffs. If for this line you have chosen option B, you will earn 3.85 euros if the second number randomly selected by the computer is 1, 2, 3, 4 or 5. If the second selected number is 6, 7, 8, 9 or 10, you will earn 0.10 euros.

Once in front of the decision table, you can always come back to the present instruction screen by clicking on Instructions.

Decision	Option A	Option B	Option choice
1	10% of earning 2.0 euros 90% of earning 1.6 euros	10% of earning 3.85 euros 90% of earning 0.1 euros	☐ Option A ☐ Option B
2	20% of earning 2.0 euros 80% of earning 1.6 euros	20% of earning 3.85 euros 80% of earning 0.1 euros	☐ Option A ☐ Option B
3	30% of earning 2.0 euros 70% of earning 1.6 euros	30% of earning 3.85 euros 70% of earning 0.1 euros	☐ Option A ☐ Option B
4	40% of earning 2.0 euros 60% of earning 1.6 euros	40% of earning 3.85 euros 60% of earning 0.1 euros	☐ Option A ☐ Option B
5	50% of earning 2.0 euros 50% of earning 1.6 euros	50% of earning 3.85 euros 50% of earning 0.1 euros	☐ Option A ☐ Option B
6	60% of earning 2.0 euros 40% of earning 1.6 euros	60% of earning 3.85 euros 40% of earning 0.1 euros	☐ Option A ☐ Option B
7	70% of earning 2.0 euros 30% of earning 1.6 euros	70% of earning 3.85 euros 30% of earning 0.1 euros	☐ Option A ☐ Option B
8	80% of earning 2.0 euros 20% of earning 1.6 euros	80% of earning 3.85 euros 20% of earning 0.1 euros	☐ Option A ☐ Option B
9	90% of earning 2.0 euros 10% of earning 1.6 euros	90% of earning 3.85 euros 10% of earning 0.1 euros	☐ Option A ☐ Option B
10	100% of earning 2.0 euros 0% of earning 1.6 euros	100% of earning 3.85 euros 0% of earning 0.1 euros	☐ Option A ☐ Option B

This test was incentivized. The average earning is 2.28 euros (minimum earning: 0.1 euro; maximum earning: 3.85 euros).

Distribution of the number of safe choices (option A) in the Holt and Laury task

Number of safe choices	0	1	2	3	4	5	6	7	8	9	10	Mean	Variance
% of participants (all treatments)	2.57	0.00	0.54	5.45	12.02	19.89	25.37	21.30	8.37	3.67	0.82	5.78	3.03
Baseline	1.76	0.00	0.00	4.31	13.92	26.22	24.22	19.50	4.56	4.48	1.02	5.77	2.60
Feedback	2.85	0.00	0.00	5.26	8.90	17.79	25.93	23.51	10.57	5.18	0.00	5.92	3.08
Market	3.07	0.00	1.54	6.69	13.12	15.94	25.90	20.93	9.89	1.53	1.38	5.66	3.38

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.37886$), between Baseline and Market treatment ($p=0.98404$), between Market and Feedback treatments ($p=0.41222$).

Block 2

Personality test

Basic information and materials for the HEXACO Personality Inventory-Revised (Ashton and Lee, 2009), an Instrument that assesses the six major dimensions of personality (Honesty-Humility, Emotionality, eXtraversion, Agreeableness (versus Anger), Conscientiousness, Openness to Experience) is made available by Kibeom Lee and Michael C. Ashton at <http://hexaco.org/hexaco-inventory>. We used 20 of the 60 item self-reported version of the test.

- 4 I feel reasonably satisfied with myself overall.
- 5 I would feel afraid if I had to travel in bad weather conditions.
- 10 I rarely express my opinions in group meetings.
- 11 I sometimes can't help worrying about little things.
- 16 I prefer jobs that involve active social interaction to those that involve working alone.
- 17 When I suffer from a painful experience, I need someone to make me feel comfortable.
- 22 On most days, I feel cheerful and optimistic.
- 23 I feel like crying when I see other people crying.
- 28 I feel that I am an unpopular person.
- 29 When it comes to physical danger, I am very fearful.
- 34 In social situations, I'm usually the one who makes the first move.

- 35 _____ I worry a lot less than most people do.
- 40 _____ The first thing that I always do in a new place is to make friends.
- 41 _____ I can handle difficult situations without needing emotional support from anyone else.
- 46 _____ Most people are more upbeat and dynamic than I generally am.
- 47 _____ I feel strong emotions when someone close to me is going away for a long time.
- 52 _____ I sometimes feel that I am a worthless person.
- 53 _____ Even in an emergency I wouldn't feel like panicking.
- 58 _____ When I'm in a group of people, I'm often the one who speaks on behalf of the group.
- 59 _____ I remain unemotional even in situations where most people get very sentimental.

This test was not incentivized and yielded no earnings.

Descriptive statistics and Cronbach- α for the personality traits

Personality trait	α	Mean	Variance	Median
EMOTIONALITY	0.76	30.37	42.17	30
Baseline:	0.77	30.47	47.45	30
Feedback:	0.76	29.5	41.61	30
Market:	0.74	31.15	36.13	30
EXTRAVERSION	0.70	36.23	27.05	37
Baseline:	0.63	36.31	22.41	37
Feedback:	0.73	35.56	29.08	36
Market:	0.71	36.83	28.73	38
Fear	0.44	8.37	4.82	8
Baseline:	0.33	8.50	4.68	9
Feedback:	0.59	8.15	5.63	8
Market:	0.34	8.48	4.05	8
Liveliness (hopefulness)	0.75	7.91	2.56	8
Baseline:	0.66	8.13	2.11	8
Feedback:	0.83	7.62	2.96	8
Market:	0.73	7.97	2.48	8

EMOTIONALITY score is defined as the sum of answers to: 5, 29, 53R, 11, 35R, 17, 41R, 23, 47, 59R, EXTRAVERSION score as the sum of answers to: 4, 28R, 52R, 10R, 34, 58, 16, 40, 22, 46R, fear as the sum of answers to: 5, 29, 53R, and liveliness as the sum of answers to: 22, 46R. R means (6-personalitytestscore).

Regarding emotionality, Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.4654$), between Baseline and Market treatment ($p=0.60306$), between Market and Feedback treatments ($p=0.18684$).

Regarding extraversion, Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.62414$), between Baseline and Market treatment ($p=0.39532$), between Market and Feedback treatments ($p=0.1936$).

Regarding fear, Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.35238$), between Baseline and Market treatment ($p=0.81034$), between Market and Feedback treatments ($p=0.42952$).

Regarding liveliness, Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.09296$), between Baseline and Market treatment ($p=0.61708$), between Market and Feedback treatments ($p=0.2187$).

Block 3

Extended Cognitive Reflection Test (CRT)

We administered the extended (seven-question) version of the CRT in which the original three questions (Frederick, 2005) are augmented with four additional questions recently developed and validated by Toplak, West and Stanovich (2014). Our measure of cognitive reflection is given by the total number of correct answers (from 0 to 7). Participants had 15 minutes in total to complete the CRT.

Taken from Frederick (2005):

A bat and a ball cost \$1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? ____ cents

[Correct answer: 5 cents; intuitive answer: 10 cents]

If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ minutes

[Correct answer: 5 minutes; intuitive answer: 100 minutes]

In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days

[Correct answer: 47 days; intuitive answer: 24 days]

Taken from Toplak et al., (2014):

If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together? _____ days

[correct answer: 4 days; intuitive answer: 9]

Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class? _____ students

[correct answer: 29 students; intuitive answer: 30]

A man buys a pig for \$60, sells it for \$70, buys it back for \$80, and sells it finally for \$90. How much has he made? _____ dollars

[correct answer: \$20; intuitive answer: \$10]

Simon decided to invest \$8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon has: a. broken even in the stock market, b. is ahead of where he began, c. has lost money

[correct answer: c; intuitive response: b]

This test was not incentivized and yielded no earnings.

Distribution of CRT scores

The CRT score corresponds to the number of correct answers to the seven questions.

CRT scores	% of participants All	% of participants Baseline	% of participants Feedback	% of participants Market
0	8.67	8.89	10.37	6.89
1	12.65	19.96	7.37	10.71
2	11.12	5.61	16.41	11.37
3	12.85	10.69	12.94	14.79
4	13.31	16.52	9.19	14.11
5	15.51	17.57	14.15	14.83
6	18.08	11.27	20.80	21.90
7	7.82	9.48	8.76	5.40
Mean	3.79	3.67	3.86	3.83
Variance	4.57	4.99	4.56	4.14

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.58232$), between Baseline and Market treatment ($p=0.69654$), between Market and Feedback treatments ($p=0.88866$).

Block 4

Loss aversion

Following Brink and Rankin (2013) we use the following loss aversion test.

For this task, your potential losses will be subtracted from your total gains in the various tests.

For each line in the table on the following screen: please indicate whether you prefer option A or option B. Even if the table has a total of 10 rows, only one row will be randomly selected for the calculation of your gains or losses. Since all lines are likely to be selected for the calculation of your gains or losses, you must give equal weight to each of your decisions. At the end of the experiment, a number between 1 and 10 will be randomly selected by the computer. This number will determine which line will be used to calculate your gains or losses. The computer will randomly select a second number between 1 and 6 to determine the exact amount of your winnings or losses.

Example:

You have chosen one option (A or B) for each of the ten rows in the table. Next, the computer randomly selects row 7 to be used to calculate your gains and losses.

- If you selected option A for line 7, then you will lose 2.40 euros if the second number chosen by the computer at random is 1, 2 or 3. If the second number chosen by the computer is 4, 5 or 6 you will win 5.00 euros.
- If you selected option B for line 7, then you will lose 1.00 euro if the second number chosen by the computer at random is 1, 2 or 3. If the second number chosen by the computer is 4, 5 or 6 you will win 1.00 euro.

Decision	Option A	Option B	Option choice
1	50% of losing 1.4 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
2	50% of losing 1.5 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
3	50% of losing 1.6 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
4	50% of losing 1.75 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
5	50% of losing 1.9 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
6	50% of losing 2.1 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
7	50% of losing 2.4 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
8	50% of losing 2.9 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
9	50% of losing 3.95 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B
10	50% of losing 7 euro(s) 50% of winning 5 euro(s)	50% of losing 1 euro 50% of winning 1 euro	☐ Option A ☐ Option B

This test was incentivized. The average earning is 0.77 euro (minimum earning: -3.95 euros; maximum earning: 5 euros).

Distribution of Option A in the loss aversion task

Number of option A	0	1	2	3	4	5	6	7	8	9	10	Mean	Variance
% of participants (all)	2.16	0.00	1.35	6.50	22.63	24.16	20.77	8.79	8.09	4.66	1.35	6.29	3.41
Baseline	5.44	0.00	1.04	1.05	6.25	29.04	21.10	20.75	5.37	6.35	3.62	5.93	4.04
Treatment	1.19	0.00	1.62	3.13	8.18	15.18	28.48	23.35	11.64	4.84	2.38	6.22	3.09
Market	0.00	0.00	0.00	0.00	5.17	23.55	23.03	18.41	9.34	12.75	7.75	6.70	2.80

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.31732$), between Baseline and Market treatment ($p=0.05$), between Market and Feedback treatments ($p=0.28462$).

Block 5 ***Reactance scale***

Following Hong and Faedda (1996), we asked participants to evaluate on a scale from 1 to 5 (1 = Strongly agree, 2 = Agree, 3 = Neither agree nor disagree, 4 = Disagree, 5 = Strongly disagree), the extent to which they agree or disagree with the following 11 statements²⁴:

Regulations trigger a sense of resistance in me.

I find contradicting others stimulating.

When something is prohibited, I usually think that's exactly what I am going to do.

I consider advice from others to be an intrusion.

I become frustrated when I am unable to make free and independent decisions.

It irritates me when someone points out things which are obvious to me.

I become angry when my freedom of choice is restricted.

Advice and recommendations induce me to do just the opposite.

I resist the attempts of others to influence me.

It makes me angry when another person is held up as a model to follow.

When someone forces me to do something, I feel like doing the opposite.

²⁴ We selected 11 statements out of the 14 proposed by Hong and Faedda (1996).

This test was not incentivized and yielded no earnings.

Distribution of reactance score

The score is computed by summing the evaluations over the 11 statements.

Reactance score	[0,10(	[10,20(	[20,30(	[30,40(	[40,50]	Mean	Variance
% of participants All	0.00	1.83	28.54	60.18	9.46	32.45	30.88
% of participants Baseline	0.00	0.00	26.47	61.76	11.76	33.04	33.78
% of participants Feedback	0.00	2.78	22.22	63.89	11.11	32.83	27.64
% of participants Market	0.00	2.85	34.29	58.57	4.29	31.72	30.46

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.98404$), between Baseline and Market treatment ($p=0.3125$), between Market and Feedback treatments ($p=0.2187$).

Block 6
Availability heuristic

Based on Tversky and Kahneman (1974), we administered an availability heuristic test.

We are going to show you a list of names. Please click OK to view this list. Please pay attention.

Mark WRIGHT
Jessica JAMES
Angelina JOLIE
Harry ROBINSON
Steve JOBS
Brandon HUGHES
John CLARKE
Sophie LEWIS
Albert EINSTEIN
Thomas PALMAN
Michelle GARRETT
Joseph SCOTT
Vincent VAN GOGH
Jack BROWN
David CLARKE

Emily ROBERTS
Marie CURIE
Roselyn LACHMAN
Janett SMITH
Julie EVANS
Nelson MANDELA
Oliver JOHNSON
Martin MORTON
Kylie DAVIES
Audrey HEPBURN
Justin TAYLOR
George WILSON
Andrew ROBINSON
Marilyn MONROE
Christine COOPER
Anne EDWARDS
Susan WOOD
Coco CHANNEL
Emma HILL
Ellen MOORE
Dylan MILLER
Michael JACKSON
Peter HALL
Alice WARD
Patricia GREEN

Were the following names on the list? You will have 4 seconds to answer for each name.
Please click OK to view the list of names.

Harry ROBINSON
Marie CURIE
Jack BROWN
Holly WILKINSON
Edit PIAF
Charles HUNT
Coco CHANNEL
Brandon HUGHES
Elvis PRESLEY
Albert EINSTEIN
Justin TAYLOR
Pablo PICASSO
Nelson MANDELA
Nancy PALMER
Vincent VAN GOGH

Emily ROBERTS
Bill GATES
Christopher LLOYD
Britney SPEARS
Dennis ELLISON

This test was not incentivized and yielded no earnings.

Distribution of scores in the availability heuristic test

The score is computed by the ratio of correct answers involving famous names to the total of correct answers.

Availability heuristic scores	% of participants All	% of participants Baseline	% of participants Feedback	% of participants Market
<0.4	0.00	0.00	0.00	0.00
[0.4, 0.5(	19.46	24.97	13.10	20.21
[0.5, 0.6(	72.33	68.74	79.06	69.45
[0.6, 0.7(	8.21	6.29	7.84	10.34
>0.7	0.00	0.00	0.00	0.00
Mean	0.58	0.51	0.52	0.52
Variance	0.001	0.001	0.002	0.001

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.67448$), between Baseline and Market treatment ($p=0.85716$), between Market and Feedback treatments ($p=0.80258$).

Block 7
Risk-seeking in the loss domain

For each line of the table presented on the following screen, indicate whether you prefer option A or option B.

Note that there is a total of 10 lines in the table, but only one line will be randomly selected to compute your payoffs. As all lines are equally likely to be selected for the computation of your payoffs, you should attribute the same importance to each of your decisions.

At the end of the experiment, a number between 1 and 10 will be randomly selected by the computer. This number will determine which line will be used to compute your payoffs. Your

payoff for the selected line thus depends on the option that you will have chosen for this line: option A or option B. To finalize the computation of your payoffs, a second number between 1 and 10 will also be randomly selected by the computer.

- For example, if the first number selected by the computer is 3, this indicates that line 3 will be chosen for the computation of your payoffs. If for this line you have chosen option A, you will lose 2 euros if the second number randomly selected by the computer is 1, 2 or 3. If the second selected number is 4, 5, 6, 7, 8, 9 or 10, you will lose 1.60 euros.
- For example, if the first number selected by the computer is 5, this indicates that line 5 will be chosen for the computation of your payoffs. If for this line you have chosen option B, you will lose 3.85 euros if the second number randomly selected by the computer is 1, 2, 3, 4 or 5. If the second selected number is 6, 7, 8, 9 or 10, you will lose 0.10 euros.

Once in front of the decision table, you can always come back to the present instruction screen by clicking on Instructions.

Decision	Option A	Option B	Option choice
1	10% of earning -2.0 euros 90% of earning -1.6 euros	10% of earning -3.85 euros 90% of earning -0.1 euros	☐ Option A ☐ Option B
2	20% of earning -2.0 euros 80% of earning -1.6 euros	20% of earning -3.85 euros 80% of earning -0.1 euros	☐ Option A ☐ Option B
3	30% of earning -2.0 euros 70% of earning -1.6 euros	30% of earning -3.85 euros 70% of earning -0.1 euros	☐ Option A ☐ Option B
4	40% of earning -2.0 euros 60% of earning -1.6 euros	40% of earning -3.85 euros 60% of earning -0.1 euros	☐ Option A ☐ Option B
5	50% of earning -2.0 euros 50% of earning -1.6 euros	50% of earning -3.85 euros 50% of earning -0.1 euros	☐ Option A ☐ Option B
6	60% of earning -2.0 euros 40% of earning -1.6 euros	60% of earning -3.85 euros 40% of earning -0.1 euros	☐ Option A ☐ Option B
7	70% of earning -2.0 euros 30% of earning -1.6 euros	70% of earning -3.85 euros 30% of earning -0.1 euros	☐ Option A ☐ Option B

8	80% of earning -2.0 euros 20% of earning -1.6 euros	80% of earning -3.85 euros 20% of earning -0.1 euros	☐ Option A ☐ Option B
9	90% of earning -2.0 euros 10% of earning -1.6 euros	90% of earning -3.85 euros 10% of earning -0.1 euros	☐ Option A ☐ Option B
10	100% of earning -2.0 euros 0% of earning -1.6 euros	100% of earning -3.85 euros 0% of earning -0.1 euros	☐ Option A ☐ Option B

This test was incentivized. The average earning is -1.59 euros (minimum earning: -3.85 euros; maximum earning: -0.1 euro).

Distribution of the number of safe choices (option A)

Number of safe choices	0	1	2	3	4	5	6	7	8	9	10	Mean	Variance
% of participants (all)	0.00	1.74	0.00	1.37	6.71	20.51	30.78	25.09	7.48	2.35	3.98	6.15	2.26
Baseline	0.00	1.93	0.00	0.00	9.43	10.67	25.84	33.36	9.74	3.03	5.99	6.4	2.44
Feedback	0.00	1.68	0.00	1.19	3.28	23.07	39.20	20.32	5.76	4.29	1.20	6.08	1.91
Market	0.00	1.62	0.00	2.78	7.28	27.21	27.79	21.76	6.94	0.00	4.61	5.97	2.34

Mann-Whitney U tests indicate that there is no significant difference between Baseline and Feedback treatment ($p=0.12114$), between Baseline and Market treatment ($p=0.05744$), between Market and Feedback treatments ($p=0.57548$).

Block 8
Demographic data

We asked participants about a few demographic questions: age, gender, diploma, baccalauréat grade, socio-professional category, color blindness, number of previous participation in experimental sessions, mother tongue.

42.2% of the participants were males and the average age of participants was 22.1 years old.²⁵

Instructions - PART 2 (oral instructions; Sentences in italics are for the readers and not shown to participants.)

In this second part, we are carrying out the experiment itself.

Here is a box of tokens. *After the experimenter has shown the box, he tells the participants: We will take a picture that will be reported on your screen to remind you the contents of the box. The experimenter takes a photograph that is supposed to resemble the one depicted on participants' screens later on.*

Instructions - PART 2

During preceding experimental sessions, 15 participants have been randomly selected to perform the following task:

- put all the chips in an opaque bag;
- pick a token from the bag, tick the color of the token on his/her computer screen;
- tick the color of the token on the sheet of paper in front of him/her;
- put the token back into the opaque bag (so that the contents of the bag always remains the same), mix the tokens;
- and again pick a token from the bag, tick the color of the token on his computer screen, tick the color of the token on the sheet of paper;
- put the token back in the bag, mix the tokens, and so on until you have drawn a total of 300 tokens;
- sign the sheet of paper at the end of his/her task.

Each selected participant was paid a fixed amount of 15 euros to complete this task in an hour. None of these participants knew your own task of the current experiment.

15 draws of 300 tokens have thus been realized in total and one of these draws will be randomly selected for the current experiment.

Instructions

You are divided into groups of 6 participants.

²⁵ In the Baseline, 40% of the participants were males, in the Feedback treatment, 39% and in the Market treatment, 49%. In the Baseline, the average age of participants is 21.8 years old, in the Feedback treatment, 22.7 and in the Market treatment, 21.7.

We will now proceed to the selection of one of these 15 draws for each group of 6 participants.

We assigned a number to each of the 15 draws, written on the back of the sheets signed by the participants who picked up the tokens.

For each group of 6 participants, a randomly selected participant will have to choose a number between 1 and 15 on his screen. All numbers between 1 and 15 can be chosen, except those already drawn in other sessions identical to yours or in this session by other participants in another group than yours. This number will be communicated on your screen.

At the end of the experiment, if you wish, you will be able to consult the sheet of paper signed by the participant who drew the tokens and who was randomly selected by this procedure. You will be able to check that this sheet of paper is the correct one to be selected by matching its number with the one given to you on the screen and to verify that the sequence of tokens drawn is correct.

Your task:

You will play for 300 periods.

At each period, your task is to decide how much you are willing to pay for a lottery that gives you the following payoffs (which may be negative) depending on the color of the token drawn by the randomly selected participant:

- Blue: 10 cents
- Red: 20 cents
- Orange: 30 cents
- Green: 40 cents
- Purple: 50 cents
- Yellow: -1000 cents

The outcome of the lottery in one period is independent of the outcome of the lottery in another period: in each period a new token is drawn into the bag which has strictly the same content in each period.

Your task

To make your decisions, you will use the fixed amount of 12 euros (1200 cents) that you were attributed to answer the tests during the first part of this experimental session.

This initial endowment is intended both to allow you to pay the lottery and to deal with the possibility of a yellow token being drawn. The earnings for each period are added to this initial endowment.

In addition, we make you a loan of 10 euros (1000 cents) for liquidity reasons, which you will repay at the end of the experiment.

If your endowment is no longer sufficient to cover the actual occurrence of a yellow token, you will no longer be able to participate in the experiment and you will only earn your variable payoffs acquired during the tests as well as 5 euros for showing-up.

Your task

You can select on your screen any price between 0 and 50 cents up to which you would be willing to buy the lottery.

The computer randomly selects an integer from 1 to 50.

If the price you indicate is greater than or equal to the number selected by the computer, then you buy the lottery for the price equal to the number selected by the computer.

If the price you indicate is strictly lower than the number selected by the computer, then you keep your endowment and do not buy the lottery.

At each period, your payoff, if you actually buy the lottery, is given by:

Lottery payoff - price paid to purchase the lottery

Your total earnings over the 300 periods are given by:

1200 cents of fixed test earnings + (lottery payoff - price you paid to buy the lottery) $\times$ 300 periods
+ variable test earnings + 5 euros of show-up fee.

In the case of MARKET TREATMENT, this screen was:

Your task

You can select on your screen any price between 1 and 50 cents up to which you would be willing to buy the lottery.

The computer randomly selects the price proposed by one of the participants.

If the price you indicate is strictly greater than the price selected by the computer, then you buy the lottery for the price equal to the number selected by the computer.

If the price you indicate is lower than or equal to the number selected by the computer, then you keep your endowment and do not buy the lottery.

At each period, your payoff, if you actually buy the lottery, is given by:

Lottery payoff - price paid to purchase the lottery

Your total earnings over the 300 periods are given by:

1200 cents of fixed test earnings + (lottery payoff - price you paid to buy the lottery) $\times$ 300 periods
+ variable test earnings + 5 euros of show-up fee.

Example 1

You have entered a price of 28 at which you are ready to buy the lottery.

The computer randomly selects between 1 and 50 the number 12. In this case, the price you have indicated is higher than the selected number, so you buy the lottery for 12 cents that corresponds to the number selected by the computer. This lottery will give you:

- 10 cents if the token drawn is blue, in which case your payoff for this period is -2 cents (10-12).
- 20 cents if it is red, in which case your payoff for this period is 8 cents (20-12).
- 30 cents if it is orange, in which case your payoff for this period is 18 cents (30-12).
- 40 cents if it is green, in which case your payoff for this period is 28 cents (40-12).

- 50 cents if it is purple, in which case your payoff for this period is 38 cents (50-12).
- -1,000 cents if it is yellow, in which case your payoff for this period is -1012 cents (-1000-12).

In the case of MARKET TREATMENT, this screen was:

Example 1

You have entered a price of 28 at which you are ready to buy the lottery.

The computer randomly selects the price proposed by one of the participants which is equal to 12. In this case, the price you have indicated is strictly higher than the selected number, so you buy the lottery for 12 cents that corresponds to the number selected by the computer. This lottery will give you:

- 10 cents if the token drawn is blue, in which case your payoff for this period is -2 cents (10-12).
- 20 cents if it is red, in which case your payoff for this period is 8 cents (20-12).
- 30 cents if it is orange, in which case your payoff for this period is 18 cents (30-12).
- 40 cents if it is green, in which case your payoff for this period is 28 cents (40-12).
- 50 cents if it is purple, in which case your payoff for this period is 38 cents (50-12).
- -1,000 cents if it is yellow, in which case your payoff for this period is -1012 cents (-1000-12).

Example 2

You have entered a price of 21 and the computer randomly selects between 1 and 50 the number 43.

In this case, the price you have indicated is lower than the selected number, so you will not buy the lottery.

In this case, your payoff is 0 for this period.

In the case of MARKET TREATMENT, this screen was:

Example 2

You have entered a price of 21 and the computer randomly selects the price proposed by one of the participants which is equal to 43.

In this case, the price you have indicated is lower than the selected number, so you will not buy the lottery.

In this case, your payoff is 0 for this period.

Information:

After each period, you will be informed about the token that has been drawn, your payoff for the lottery, as well as your available cash which is equal to your initial endowment (2200 cents) plus or minus the accumulated gains and losses for buying (or not) the lottery.

You will also be able to see this information at the bottom of your screen for all periods before the current period.

At the end of the experiment, if you wish, you can have a look at the sheet of paper signed by the participant who drew the tokens. This will allow you to check that the sequence of drawn tokens is correct.

In the case of FEEDBACK AND MARKET TREATMENTS, this screen was:

Information:

After each period, you will be able to observe for 4 seconds the prices offered by the other participants and their relative position in relation to your own price proposal by means of a simple graph. An example is shown below where you have proposed a price of 24 while the other five participants have proposed the following prices: 12, 28, 28, 30 and 41.

On the next screen, you will be informed about the token that has been drawn, your payoff for the lottery, the price that you have offered, the average price offered by the other participants as well as your available cash which is equal to your initial allocation (2200 cents) plus or minus the accumulated earnings and losses.

You will also be able to see this information at the bottom of your screen for all periods prior to the current period.

Decision-making time:

To ensure that the experiment is completed on time, we expect you to make your decision within 10 seconds in each period.

Note that you can take a little more time at the beginning of the experiment and that you are expected to make your decisions more quickly over time.

You are given 30 seconds in the first period and 20 seconds in the second period.

From the third period onwards, you will have 10 seconds to make your decision. A timer on the screen will indicate the time you have to enter a price using the cursor and validate your decision. If you do not enter a price on the screen and validate your decision in time, the number indicated by the cursor will be selected.

Example of a decision screen

The screenshot displays the GATE Lyon / St-Etienne logo in the top left. The main interface is divided into two sections: 'Instructions' (light blue) and 'Session 2' (dark blue). Below the 'Instructions' section, a timer indicates 'Période 1/300' and 'Temps restant : 24 secondes'. The central part of the screen features a vertical bar labeled 'Paiement par couleur' with a color scale from 10 to -1000. To the right of this bar, text asks 'Combien êtes-vous prêt à payer pour acheter la loterie?' and provides instructions on how to use the slider. The slider itself is a horizontal bar with a cursor, ranging from 0 to 50. At the bottom left, there is a table with columns for 'Période', 'Offre d'achat (nombre curseur)', 'Nombre choisi par l'ordinateur', 'Achat de la loterie', and 'Couleur tirée au sort / paiement'. A 'Valider' button is located at the bottom right.

The *baseline* version of the software is available at:

https://drive.google.com/drive/folders/17gt8eBe1Z61Zgl_GH1kHD_Xr26JHWp6R

SPECIFIC INSTRUCTIONS FOR THE RANDOMLY SELECTED PARTICIPANT (PICKER) (see CCH)

You are the selected participant. You have been selected to perform a different task from the other 6 participants.

Your task is to:

- put all the chips in an opaque bag;
- pick a token from the bag, tick the color of the token on your computer screen, tick the color of the token on the sheet of paper in front of you, put the token back into the opaque bag (so that the contents of the bag always remains the same), mix the tokens, and again pick a token from the bag, tick the color of the token on your computer screen, tick the color of the token on the sheet of paper, put the token back in the bag, mix the tokens, and so on until you have drawn a total of 300 tokens;

- to sign the sheet of paper at the end of your task.

Your earnings consist of a fixed amount of 15 euros. If you do not complete your task in an hour, or if you make a mistake (i.e. tick the wrong color), you will only be paid 10 euros. You will be under the supervision of an experimenter at all times.

It is expected that you will take an average of 10 seconds to pull a token, tick the color of the token on your computer, tick the color on the sheet of paper, mix the tokens. A timer on the computer will tell you if you are on time.

If you have any questions, please raise your hand and we will come to answer your questions.

Appendix B: Sequence of asset returns

Appendix C: Additional analyses

Table C1. Decrease in Bids, Tail Events and Anger Trait

Panel probit regressions with random effects and robust standard errors clustered at the individual levels in parentheses, session fixed effects included. Regressions are performed for those investors who scored above the median on risk-seeking in the loss domain.

VARIABLE	UP DUMMY			
SAMPLE	Investors bought the asset in previous period			
Anger trait	Bottom Quartile (1)	Below Median (2)	Above Median (3)	Top Quartile (4)
Tail Event Dummy	0.140 (0.433)	0.166 (0.337)	-0.126 (0.339)	-0.265 (0.616)
Feedback Dummy	0.799 (0.520)	0.097 (0.062)	0.049 (0.066)	0.553*** (0.003)
Market Dummy	-0.037 (0.520)	-0.432*** (0.126)	0.709*** (0.065)	0.604*** (0.030)
Feedback × Tail Event Dummy	0.476 (0.698)	0.298 (0.554)	-0.123 (0.466)	0.072 (0.791)
Market × Tail Event Dummy	0.188 (0.632)	0.028 (0.552)	1.298** (0.574)	1.582** (0.795)
Period	0.0006 (0.006)	-0.0005 (0.0005)	-0.0002 (0.0006)	0.0001 (0.0006)
Number of Tail Events	-0.050 (0.052)	0.001 (0.049)	-0.044 (0.043)	-0.030 (0.059)
Constant	-1.166*** (0.526)	-0.437*** (0.062)	-1.001 (0.096)	-0.953*** (0.094)
Observations	3,327	5,020	4,945	2,741
Number of Groups	29	43	41	21

Robust standard errors in parentheses, session fixed effects included. *** p -value < 0.01, ** p -value < 0.05, * p -value < 0.1