The salience of Informed Risk: an experimental analysis

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Abstract

During the last decade, scholars and policy makers have increasingly concentrated on investors' excessive risk taking. By conducting an online pair-wise lottery choice experiment, we assess for variations in the level of risk taken when altering the research frame. For instance, in our experimental treatments we affect subjects' awareness about the risk-taking decision by displaying or not displaying (financial) risk warning messages with different intensity. We also carry out additional robustness checks searching for possible relations between risk aversion, cognitive ability and questionnaire-based risk aversion scores.

Our results provide statical evidence for the efficacy of informative and very salient messages in mitigating risky decision, offering several policy implications. The intuitions, deriving from a 177-subject sample, could indeed provide useful insights for designing effective risk reduction policies and maybe be applicable not only to a financial market context but also by extension to other risk-taking activities, i.e., online betting and gambling.

Keywords: Individual decision-making; risk; experimental economics; Information effect; Finance.

1. Introduction

Our lives are scattered with blurred situations and choices involving a degree of risk and uncertainty. Financial decisions, among others, are in fact heavily dependent on individuals' risk perception and aversion. Risk aversion itself is the bedrock of most theories employed by economists, especially the one of choice. It assumes, indeed, a major role in explaining the functioning of financial markets and investment decisions' drivers. In last two decades, however, the assumptions behind the functioning and the efficiency of financial markets have been questioned by behavioural researchers. Behavioural scholars, for instance, support the idea that human behaviour might be influenced by a variety of factors: socio-economic, cultural, frame, etc. and therefore consider market efficiency a theoretical concept **(Barberis & Thaler, 2003).**

In the last few years, policy makers and researchers have strongly focused on investors' excessive risk taking, usually observed in markets where information is strictly asymmetric and individuals possess scarce or limited financial literacy **(1 - web link)**. As a connected result, the European Union has introduced a much tighter market regulation creating a framework where retail investors can make more informed decision and take on more reasonable and sustainable levels of risk (by imposing limits on leverage levels, i.e., 2:1 on cryptocurrencies CFDs). **(Decisions (EU) 2018/795 and 2018/796)**

One financial instrument the European Securities Market Authority (ESMA) has focused on is the CFD (CFD, or contract for difference, is a derivative product that allows to trade on the price movements without owing the underlying asset), a type of investment derivative known for the use of high leverage and easy access via online trading brokers which engaged in aggressive marketing campaigns in the past years (including cold calling and dubious online marketing material). In 2018 ESMA adopted a product intervention on CFDs and binary options for the retail investor's market limiting the level of leverage allowed and *forcing the adoption a standardized risk warning message*. **(2 - web link)** The message must disclose the involved risks and state the percentage of retail investors losing money when trading on the platform.

An example would be: "CFDs are complex instruments and come with a high risk of losing money rapidly due to leverage. 71% of retail investor accounts lose money when trading spread bets and CFDs with this provider. You should consider whether you understand how CFDs work, and whether you can afford to take the high risk of losing your money."

ESMA clarifies that "the risk warning shall be in a layout ensuring its prominence, in a font size at least equal to the predominant font size and in the same language as that used in the communication or published information".

Nevertheless, the risk warning is often displayed on the broker's website only, before trading occurs, and not shown at all during the trading activity, especially if the retail investor is using an external platform to place orders (such as the very common MetaTrader 3; **3 - weblink**).

Expanding on this real-world framework and considering the current market turmoil, with cryptocurrencies (where CFDs are extremely common) **(Hasso et al., 2019)** displaying unprecedented volatility, we aim to test in an *online laboratory setting* whether displaying a risk warning message is truly effective in reducing the level of risk taken and whether its placement makes a difference.

2. Literature Review

Before illustrating our experimental design and research hypotheses, in this section, we discuss the state of the art around to the main aspects of the present work. Specifically, there are two significant topics included in our research: i) the investors' decision-making process under risk, and the ii) salience of information in underpinning/undermining their risk-taking attitudes.

2.1. Individual decision making under risk

Risk aversion has long been studied by economic scholars. Recently two definitions have been proposed. It can either be seen as **(Montesano 1985, 1986, 1988)** directly linked to the size of the risk premium (i.e. to the difference between the expected value of the action under consideration and its certainty equivalent); or as a decreasing preference for an increasing risk. **(Chew et al. 1987, Machina 1987, Röell 1987, Yaari 1987).** The two are indeed equivalent if a Von Neumann-Morgenstern utility function exists.

Beside the socio-demographic characteristics influencing risky decision, different attitudinal factors might be prominent and interesting in profiling individual risk propensity: i) the financial risk tolerance and ii) cognitive abilities.

Strongly associated to the concept or risk aversion, in the financial markets' context, is risk tolerance.

Grable (2000) defined financial risk tolerance as "the maximum amount of uncertainty that someone is willing to accept when making a financial decision". Demographic parameters such as gender, age, education, income, occupation, etc., have been of particular interest to researchers as independent variables shaping the investor's financial risk tolerance **(MacCrimmon and Wehrung, 1986; Riley and Chow, 1992)**. **Faff et al (2008)** observe that risk aversion scores obtained from lottery-based experiments **(i.e. Holt Laury (2002) in particular)** are strongly aligned with those obtained from financial risk tolerance (FRT) questionnaires.

Considering the existing literature on cognitive abilities, **Dohmen et al. (2010)** findings indicate that a greater degree of risk aversion and more pronounced impatience are more common when subject's cognitive ability scores are low. In their study these results are significant, and robust even when checking for personal characteristics, educational attainment, income, and measures of credit constraints.

2.2. Information salience

With regards to information salience starting from common understanding that attention is a scarce and limited cognitive resource affecting economic decisions **(Simon, 1955)** and therefore salience of information emerges as a key component in framing decisions, we aim to expand on previous literature. Building on strong insights

on human perception, Pedro Bordalo et al. **(Bordalo et al., 2012, 2013, 2016)** proposed 'Salience Theory' to assess economic results of the way salience captures attention. In their theory, the salience of choice systematically impacts choices through perturbation of individual preferences. Their main intuition lies on two psychophysical concepts of perception, which are known as the Weber-Fechner law **(Dzhafarov et al., 2011)**. Our innovation lies in the fact that we propose to test salience by introducing a (financial) risk warning message and having the same identical lotteries played under all the treatments. Literature on warning messages is very limited in economics but it very common in psychology especially in the context of gambling. **Gainsubry et al (2015)** for example find that informative and self-appraisal messages appear to facilitate responsible gambling by encouraging individuals to think about their time and money spent.

Interestingly enough, we measure the salience of information by varying the intensity of the warning message, moving from one-shot communication introduced at the beginning of the lottery game to a reiterated message across the different steps of the risk elicitation task. This is expected to induce subjects to mitigate their risk-attitude.

3. Experimental design and hypotheses set

3.1. The risk elicitation task

In this section we introduce the general experimental framework first and then we illustrate the treatments specifics. As briefly specified in the introduction our main research objective is to test whether displaying a (financial) risk warning message is effective at reducing the level of risk taken by individuals and whether its placement makes any difference. To reach such purpose, we had to elicit and interpret subjects' risk aversion. In line with well-established literature, we created an *online experimental set-up* which included a list of 10 pairwise lottery choices (see table underneath).

In fact, when it comes to measuring individual's risk attitudes, **Holt and Laury (2002)** and derived approaches have become the *gold standard* in economic experiments, given the relative ease in implementation.

Lottery A		Lottery B	
50 ECU	**40 ECU**	**96,25 ECU**	**2,5 ECU**
10%	90%	10%	90%
20%	80%	20%	80%
30%	70%	30%	70%
40%	60%	40%	60%
50%	50%	50%	50%
60%	40%	60%	40%
70%	30%	70%	30%
80%	20%	80%	20%
90%	10%	90%	10%
100%	0%	100%	0%

Table 1: Scheme of the 10 lottery choice pairs

The 10 lottery choice pairs, *shown 1 per time during the experiment (i.e. 1 pairwise lottery choice per time before advancing to the next)*, appeared with a layout inspired by **Hey et al (2018)** for quick and easy visualization (i.e., graph area varying with probability and payoff).

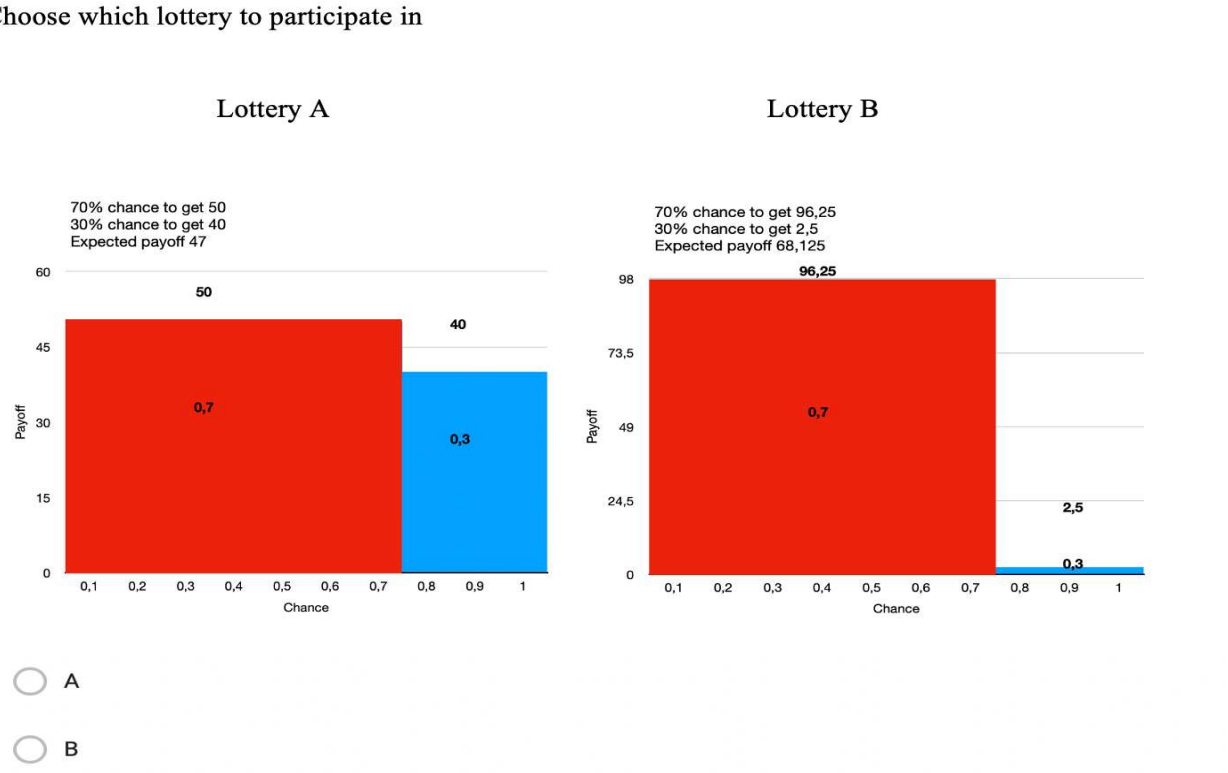

Figure 1: screenshot of the graphical representation of the lottery pay-off included in the questionnaire.

According to **Holt and Laury (2002),** risk neutral agents would pick lottery A for the first 4 lottery pairs and then switch to lottery B at the fifth choice (*without switching back*). Since the expected value of lottery B is higher agents switching to lottery B earlier on would be relatively risk loving and those switching later on would be relatively risk averse. A constant relative risk aversion parameter (cRRA or in some cases simply r) is associated to the number of A lottery choice (also known as safe choices).

Number of safe choices	r (min)	r (max)	Risk preference classification
0	<	-1.71282	Highly risk loving
1	-1.71282	-0.946837	Highly risk loving
2	-0.946837	-0.486575	Very risk loving
3	-0.486575	-0.142632	Risk loving
4	-0.142632	0.146363	Risk neutral
5	0.146363	0.411456	Slightly risk averse
6	0.411456	0.67618	Risk averse
7	0.67618	0.970581	Very risk averse
8	0.970581	1.36839	Highly risk averse
9	1.36839	<	Stay in bed
10	---	---	Non-applicable

Table 2. Holt and Laury scheme (2002) adapted from Alexy, M, Georgantzis, N, Kacer, M et al. (2016)

3.2. Experimental settings

The experiment was conducted online on the 18th and the 19th of May 2021. The sample was made of 177 undergraduate students of the faculty of business at the University of Bari. Completion time was recorded for each subject, in order to check for abnormally short completion time (impatience) and abnormally long completion times (due to distraction, lack of interest, etc.).

In order to test for the effectiveness of a warning message (measured by referring to measured constant relative risk aversion parameter - cRRA), the same identical 10 lottery choice pairs, were played under 3 different experimental treatments. Each subject participated in 1 treatment only. Subjects were randomly assigned to treatments in an alphabetical fashion by surname initial.

In order to assess for very large risk aversion at the very beginning of each treatment subjects were asked - prior to visualizing any of the lotteries - whether they wanted to participate in the lotteries or take home the endowment. This is referred below as initial question.

English Translation of the message: "You have a 10 ECU endowment. Do you wish to participate to the lotteries? If so, your earnings will be between 2,5 and 96,25 ECU but you give up the endowment. If you do not participate you will receive the endowment."

Subjects exiting here represent subjects not even entering the financial/investment markets because of their risk aversion. That is, they prefer a certain value rather than an aleatory**.** However, subjects have the chance to leave the lottery within each stage of the game.

Subjects entering the game are involved in one of the three different treatments (T1-T3). As anticipated above, moving from T1 to T3, we improve the intensity of the following **warning message**[1]:

"You are in a risky context. Your earnings are dependent on events outside of your control. Responsibly pick the risk level, remembering to correctly compute the lottery prizes with their winning probability"

The number of times that this information appears on subject's screen depends upon the type of treatment (see table 2). As it can be observed, the baseline treatment (T1) does not include any kind of warning. Moving to T2, the warning message is visible only once at the beginning of the 10 decision-problem sequence, while in T3 the message is reiterated and it is shown within each single decision problem.[2]

[1] Hereafter, all the parts of the questionnaire included refers to the English translation of the Italian text.

[2] In this treatment the initial question features no warning message, but subjects are allowed to modify the choice, making not relevant the timing of the signal appearance.

# Treatment	Information Salience	N of participants
T1	None	46
T2	Warning message shown just once before the lottery section is entered alongside the initial question on the same screen	53
T3	Warning message shown after every single lottery choice, providing subject with the opportunity to reconsider and modify their choice after confirming the message has been read	78

Table 3. Summary of the three treatments.

In each treatment after playing the lotteries subjects were asked to complete in this exact order: a 6-item financial risk tolerance (FRT) questionnaire plus a perceived financial wellbeing question and a 9-item cognitive ability test (1 point per correct answer, min/max score 0/9, no penalty for wrong answer).
The financial risk tolerance questionnaire (alongside our risk tolerance rating scale) used was a translation in Italian of the one employed by the **USA Financial Advice company Edward Jones** for its clients. It has been chosen for the simplicity of it questions, requiring no financial knowledge, and the quick completion time. The cognitive ability questions instead were a translation in Italian of *the numeracy and cognitive* ability test used by **Taylor (2013).**
The financial wellbeing question was a straight-forward answer on a scale from 1 to 10, indicating the perceived financial situation.
For the sake of clarity, the whole transcription of the questionnaire can be found in the appendix A.
Subjects were informed that at the end of the experiment 10% of the sample would randomly be selected and one of the ten decisions would be sampled for the payment (1 ECU=0.1 €).

3.3. Research hypothesis

Following the existing theoretical studies on the salience of information, we can formulate the main working hypothesis as follow:

- **H1:** *Moving from T1 to T3, where the intensity of the warning message is higher, subjects display greater risk aversion – i.e., showing the message at each lottery is effective in reducing the level of risk borne*

Psychological research on salience shows that salient stimuli draw human attention due to their contrast with surroundings, their surprising nature relative to past experiences, or their prominence. **(Bordalo et al., 2021).** Psychological research in the context of gambling if extended (even though the basis for extension if open to discussion) would support the hypothesis **(Monaghan et al. 2010)**.

Specifically, we expect two different behaviors:

- ***H1.1*** *If the warning message is effective, a greater part of subjects will exit the risky lottery games. Hence, we will observe a higher exit rate in T3.*

- ***H1.2.*** *Subjects participating to the lottery will consistently opt for the "safe option", reducing the risk propensity and then, the selection of the riskiest option.*

As qualitative robustness check, we will control if our results are consistent with and contribute further to the existing literature on cognitive alibility and financial tolerance.
In particular:

- **H2.** *Financial risk tolerance reflects the individual background propensity to assume risk.*

  This will be in line with all the existing studies relating the financial risk tolerance and the broader definition of risk propensity (see section 2.1).

- **H3:** *Subjects with low cognitive ability scores display greater risk aversion*

  Despite alternative studies proposing the absence of a potential relationship (**Andersson et al., 2016, 2020),** this would be in accordance with **Dohmen et al. (2010)** and with the theories of choice bracketing **(Tversky and Kahneman, 1981; Read et al., 1999)**. Here, some individuals may have trouble bracketing choices broadly, in other words in recognising how single risky decisions integrate with other assets like lifetime wealth, or to conceptualise and factor in future considerations with current aims. The absence of this effect This would be in line with who find that cognitive ability is related to random decision-making errors rather than to risk preferences.

Additionally, we implement a qualitative check trying to recognise individuals switching back and forth between lottery choice A or B, commonly labeled "multiple switchers". Indeed, notwithstanding its wide adoption, a practical inconvenience of Holt & Laury approaches is the share of individuals switching back and forth. Such conduct diverges from customary expectations on preferences **(Charness et al., 2013).** Multiple switching behavior (MSB) is typically considered low-quality decision making, although some studies claim that MSB may imply indifference amongst a variety of options **(Andersen et al., 2006).**
In our work we investigate the relationship between multiple switching behaviour, cognitive ability and effort (treatment completion time). For instance, multiple switchers may not correctly understand the elicitation methodology or give inconsistent answers **(Lévy-Garboua et al., 2012). Dave et al. (2010),** in fact, suggest that cognitive ability plays a role in comprehension of the MPL. Furhermore, boredom and -then- a lack of

effort can be also prominent in explaining switching behavior (**Lévy-Garboua et al., 2012**; **Bauermeister and Mußhoff**, 2019). Considering these aspects, we offer an understanding of the existence of multiple switchers on the basis of i) the effort used to complete the task, proxied by the completion time, and ii) their level of comprehension, proxied by the cognitive abilities. The latter variable is well-known, and it has been employed in previous paper to profile multiple switchers, while extremely low (or high) completion time might identify those individuals answering randomly in few seconds or taking an unreasonable amount of time to complete the task. As it will be observed in the next section, this approach is promising in identifying MSB.

4. Results

We have recruited 20-years-old economic students. The sample is predominantly composed by women (56%). Considering our variable of interests, the cognitive abilities (average=5.67), the financial risk tolerance (average=43.35), and the financial wellbeing (average=6.27) are not statistically significant across groups.
To this end, we can conclude that the three subsample are homogeneous. The average completion time is around 36 minutes.
As opening results, it is possible to observe that the exit rate differs across the three treatments: 19.5% in T1, 12. 5% n T2 and 38.5% in T3. This would suggest a mitigation of the risk propensity in T3 (in line with our first set of hypotheses).

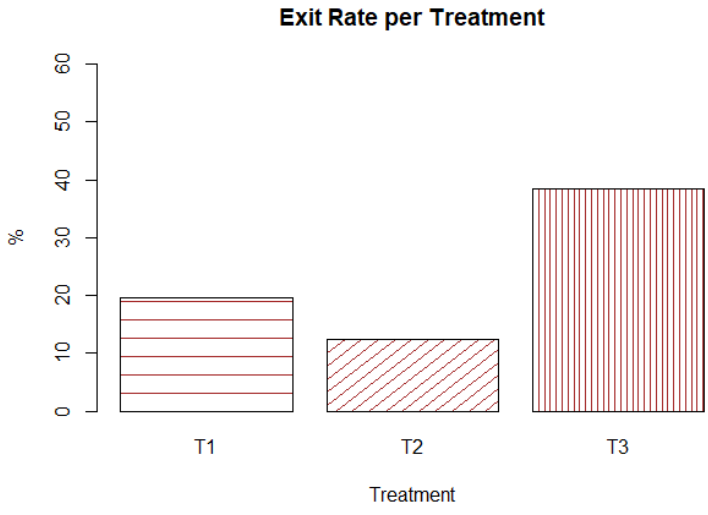

Figure 2: Bar-plot of the exit rate for each treatment.

To better identify this effect, we include a probit model considering the individual exit option as dependent variable (Table 4)

	(1) Baseline	(2) Full
TR 2	-.026	-.032
	(.291)	(.292)
TR 3	.564**	.572**
	(.257)	(.26)
Female		.044
		(.207)
FRT		-.001
		(.007)
Financial well-being		-.051
		(.069)
Cognitive Ability		.007
		(.052)
Constant	-.857***	-.575
	(.212)	(.627)
Observations	177	177
Pseudo R^2	.039	.042

Robust standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 4. Probit Model. Exit rate as dependent variable.

As it can be noticed, the unique aspect impacting the exit-rate choice is the information effect, since all the control variables are not statistically significant. This validates the huge impact that information has in mitigating risk, as assumed in our theoretical framework.

To better analyze the reduction in risk propensity, it is worth examining how lottery participants deal with risky decision. Figure 3 offers an overview of the risk aversion rate (calculated as the number of subjects selecting the safe option A for each decision problem). As evident, risk aversion is higher in T3, since the relative line is systematically above the other ones. This result is also confirmed by a Kolmogorov-Smirnov test.

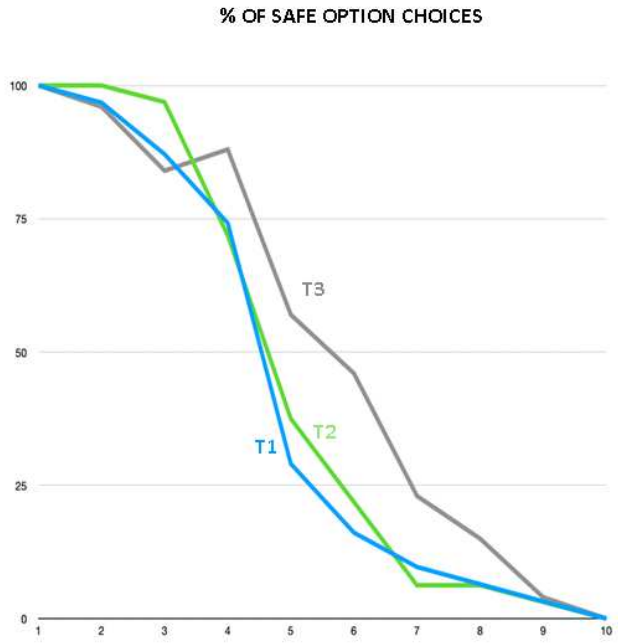

Figure 3: Fraction of the safe option choice across the three treatments. Percentage of safe option (Lottery A) choices on the y-axis for each decision problem (x-axis).

As a further empirical exercise, we conduct an interval regression model, considering as dependent value the lower and the upper limits of the cRRA interval corresponding to the switching from lottery A to B. This is the most common empirical strategy for the analysis of the **Holt and Laury (2020)** outcome (see **Caferra et al., 2021**). We isolate the treatment effect controlling for other subjects' characteristics, such as gender and income[3]. In addition, we check the existing correlation between the two individual characteristics mentioned in the literature review: financial risk tolerance and cognitive abilities.

We propose several versions of the model discussing the potential presence of MSB. Following the existing literature (see section 3.3), we introduce as baseline variable the low level of cognitive ability. To this end, we consider the lower part of the distribution (i.e. a score lower that 3) as reference for those having difficulties in clearly define their risk preferences given their difficulties in understanding the task.

Here, we add our proxy of effort, as suggested in section 3.3. As robustness check, we consider 2 different thresholds of low/high completion time. Specifically, we firstly consider the first and the last decile (high threshold-HTMS), and then we replicate the same exercise considering the first and the last quartile (low threshold-LTMS).

Considering only the low threshold of cognitive abilities, we are able to identify 2 subjects, 6 subjects, 2 subjects in T1, T2, T3 respectively. In the HTMS case, we are able to identify the 1 subject T1, 4 subjects T2,

[3] Considering that we have recruited 2nd-year students of the same economic course, we do not control for age and type of education.

9 subjects T3 of multiple switchers in the sample, while in the LTMS one the share increases, getting the 5 subjects T1, 7 subjects T2, 17 subjects T3.

In the end, we fail to recognize only 1 subject in T1 and 1 in T2, and 5 subjects in T3.

Biased or non-constant preferences might arise for lack of effort and low levels of task comprehension in the classified cases. For the misclassified subjects, we cannot conclude if their preferences are simply non-constant, or they have an erratic behavior for some others out-of-control circumstances. We add them in the last column of the regression models (5).

In addition, we discard 6 observations where subjects fail the rationality test: in the last decision problem, lottery B has a higher reward as certain value, hence it is completely irrational to opt for lottery A.

	(1) Baseline-NoMS	(2) Full-NoMS	(3) Full-LTMS	(4) Full-HTMS	(5) Full
TR 2	.002	-.004	.014	.007	.006
	(.116)	(.109)	(.107)	(.102)	(.1)
TR 3	.262**	.277**	.384***	.352***	.232**
	(.128)	(.12)	(.121)	(.11)	(.105)
Male		.103	.166*	.151*	.17**
		(.091)	(.092)	(.088)	(.086)
FRT		-.009***	-.007**	-.006*	-.006**
		(.003)	(.003)	(.003)	(.003)
Financial wellbeing		-.007	0	-.007	-.002
		(.033)	(.032)	(.03)	(.029)
Cognitive Ability		-.042*	-.028	-.027	-.008
		(.022)	(.023)	(.023)	(.022)
Constant	0.111	.721**	.434	.449	.344
	(.086)	(.281)	(.296)	(.277)	(.27)
Observations	86	86	107	118	122
Log-likelihood	-153.453	-148.366	-190.576	-210.753	-217.428

Table 5. Interval Regression Model (Risk). Risk-aversion interval as dependent variable.

The results confirm the evidence of figure 3. The risk-aversion parameter is higher in T3, where the information is salient and substantial. Considering the other variables, we observe a positive correlation between the financial risk attitude and the general risk attitude elicited with our experiment. Accordingly, this coherency supports the quality of the data collected. In different model specifications we account for the existence of LTMS and LTMS (3-4), including also erratic decision-makers (5), defined as the residual MSs do not falling into the previous categories. In this case, we consider their risk interval considering as lower and upper limits those related to their first and last switch respectively.

In all the cases, their inclusion does not alter the statistical significance of the estimation.

We can summarize the results of the three hypotheses as follow:

- **R1:** *In T3, where the intensity of the warning message is higher, subjects display greater risk aversion – i.e., showing the message at each lottery is effective in reducing the level of risk borne.*

As suggested in **Schie and Pligt (1995),** framing and salience are prominent in influencing risky decision. In this case, it turns successful in mitigating individual risk propensity.

- ***R1.1*** *A greater part of subjects will exit the risky lottery games, resulting in a higher exit rate in T3.*
- ***R1.2.*** *Subjects participating to the lottery consistently opt for the "safe option", reducing the risk propensity and then, the selection of the riskiest option.*

  Both empirical results corroborate the hypothesis made. Subjects are discouraged to assume risk, opting for a certain value (i.e. the initial endowment) and the warning message is persuading subjects to reduce their risk propensity. Considering the effect in T2, we observe that a one-shot message is not salient enough to alter subjects' behavior. The re-iteration (i.e. the salience) of the same signal prominently influence decision-makers mind.

- **R2.** *Financial risk tolerance reflects the individual background propensity to assume risk.*

Similarly to **Faff et al. (2008**), we observe that risk aversion scores obtained from lottery-based experiments is correlated with with those obtained from financial risk tolerance (FRT) questionnaires. Specifically, higher risk propensity is consistent with higher financial risk tolerance.

- **R3:** *Subjects with low cognitive ability scores display greater risk aversion*

We provide (weak) statistical evidence supporting the relationship between cognitive abilities and risk preferences. In particular, we observe that individuals with low levels of cognitive abilities lead to higher risk aversion. This might be probably associated with higher prudence due to the difficulties in properly quantifying the risk related to each task.

- **R4:** *Multiple switching behavior is (partially) proxied by Cognitive abilities and effort variables.*

Low cognitive abilities are powerful in predicting multiple switching behavior. As in **Andersson et al. (2020),** cognitive abilities are more likely to explain bias in preferences rather than robust risk attitudes. Furthermore, boredom and -then- a lack of effort figures out switching behavior (**Lévy-Garboua et al., 2012**; **Bauermeister and Mußhoff**, 2019).

5. Discussion and Conclusions

Risk and uncertainty are nowadays broadly recognized as cornerstones of economic theory. Financial decisions, especially, are strongly dependent on individuals' risk perception and aversion. Building on those concepts, ESMA in 2018 forced the inclusion of a standardized risk warning when retail investors engage in trading activity on CFDs and binary options. Nevertheless, the warning is often displayed on the broker's website only, before trading occurs, and not shown at all during the trading activity.

We tested the effectiveness of such approach via an online experimental setting. Resorting to a pair-wise lottery choice risk elicitation task we tested for any difference in the recorded behaviour (and displayed risk aversion) when no risk warning is present, risk warning is present before engaging in the lottery choice activity, risk warning is shown after every single lottery choice prompting subjects to reconsider their choice if they wished to do so.

As a qualitative robustness check we also assessed for financial risk tolerance (questionnaire based task) and cognitive abilities searching for any relation between risk elicitation task results and those.

Our experimental results show that displaying a message after every single choice is taken is the most effective set-up in reducing risk taking while we observe very little difference between no message and message shown just once treatments. This result is consistent with Schie and Pligt (1995) who state that framing and salience are prominent in influencing risky decision. In other words, individuals seem not to get too caught up in small information and instead need very evident communication.

In accordance to well-established literature by Faff et al. (2008), we also find that risk scores obtained by means of Holt Laury lottery choices and financial risk tolerance questionnaires are greatly comparable.

We also provide some statistical evidence in support of the relationship between cognitive abilities and risk preferences. We detect that individual with low cognitive abilities scores display great risk aversion. This might be associated with higher prudence due to the difficulties in properly quantifying the risk of each task.

Our results could provide useful insights for designing effective risk reduction policies focusing on information prominence and salience. Our intuitions could be applicable not only to a financial market context but also by extension to other risk-taking activities, i.e. online betting and gambling.

Further research could concentrate on replicating this set-up with subjects who engaged in some trading activity in the past 6 months, indeed undergraduate students are extremely unlikely to have engaged in some trading activity investing their own money. This would extend the literature on the external validity of experiments (Guala and Mittone, 2005). However, as discussed in several papers (see, among others, Caferra et al., 2021), the "typical subjects' pool" might be representative of the real-life professional traders' behavior under risk, validating the strength of our results.

It would also be interesting to report our laboratory setting in a real-life context, checking whether online brokers observed a dip in trading activity or less risk taking by investors after the introduction of the risk warning message on their website, even though being the data confidential this task would be very difficult to conduct.

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Appendix A

The online questionnaire

An English translation of the online experimental set-up can be found here for reference

https://forms.gle/91CJ7nK4P8e1DsSB6

Appendix B

Financial risk tolerance questionnaire scale

(Taken from the Edward Jones – risk tolerance questionnaire)

https://www.edwardjones.com/sites/default/files/acquiadam/2021-02/risk-tolerance-questionnaire.pdf)

	Your Answer					Answer Value
1		A=0	B=5	C=12	D=17	
2		A=0	B=8	C=16		
3		A=0	B=8	C=16		
4		A=0	B=8	C=17		
5		A=0	B=6	C=12	D=17	
6		A=0	B=8	C=17		
					Total	

Risk Tolerance Scale	
80–100	High
60–79	Medium to High
40–59	Medium
19–39	Low to Medium
0–18	Low