CSEF

Centre for Studies in Economics and Finance

WORKING PAPER NO. 497

Cutting Through the Fog: Financial Literacy and the Subjective Value of Financial Assets

Marco Nieddu and Lorenzo Pandolfi

April 2018

University of Naples Federico II

University of Salerno

Bocconi University, Milan

CSEF - Centre for Studies in Economics and Finance
DEPARTMENT OF ECONOMICS – UNIVERSITY OF NAPLES
80126 NAPLES - ITALY
Tel. and fax +39 081 675372 – e-mail: csef@unina.it
ISSN: 2240-9696

CSEF
Centre for Studies in Economics and Finance

WORKING PAPER NO. 497

Cutting Through the Fog: Financial Literacy and the Subjective Value of Financial Assets

Marco Nieddu* **and Lorenzo Pandolfi****

Abstract
We examine the impact of financial literacy on investors' subjective valuation of financial assets. In a laboratory experiment, we study how the certainty equivalent of a risky lottery changes when varying the framing of the lottery – a financial asset *vs.* a coin toss – and participants' level of financial literacy – *via* teaching basic financial notions. Enhancing financial literacy improves the understanding of the lottery's structure and increases its certainty equivalent, thus offsetting the negative effects of the financial framing. Our results – which can be rationalized by ambiguity aversion – highlight the importance of promoting financial education to stimulate households' financial market participation.

JEL Classification: D14, D81, G11, G40, I22

Keywords: financial literacy; experimental finance; financial market participation; ambiguity aversion.

Acknowledgements: We gratefully acknowledge financial support from the Catedra Santander (CATEDRA SANTANDER-UPF Finances (CA00016)), from the Barcelona Graduate School of Economics (SEV-015-0563) and from the Department of Economics and Finance at the University Pompeu Fabra. We also acknowledge use of the services and facilities of the Behavioral Sciences Laboratory at the University Pompeu Fabra. We are deeply grateful to Jose Apesteguia, Xavier Freixas, Albrecht Glitz and Robin Hogarth for their insightful comments and suggestions. This paper greatly benefited from feedback received at different stages from Cristina Bellés, Javier Gil-Bazo, Niklas Heusch, Filippo Ippolito, Tullio Jappelli, Gaël Le Mens, Maria Lombardi, Rosemarie Nagel, Tommaso Oliviero, Marco Pagano, Vittorio Pelligra, José Luis Peydró, Marta Santamaria and Tomas Williams. Finally, we thank the Department of Economics and Business at UPF where part of this work was carried out.

* Università di Cagliari and CRENoS. E-mail: marcog.nieddu@gmail.com.
** Università di Napoli Federico II and CSEF. E-mail: lorepandolfi@gmail.com

Table of contents

1 Introduction

In recent years, a growing emphasis has been placed on the role of financial literacy in individual decision-making.[1] Financial literacy affects economic behavior in many ways and is found to be alarmingly low even in developed countries, where most people have limited understanding of financial markets.[2] Despite its importance from a policy perspective, few empirical studies assess the causal impact of financial literacy on the financial behavior of economic agents. The aim of this paper is to shed light on this link, with a focus on the subjective valuation of financial assets.

A deeper understanding of the relation between financial literacy and financial behavior is important for a multiplicity of reasons. Especially in recent times when the range and variety of financial products and services available to small investors has grown substantially, the level of financial knowledge of an individual is likely to play a major role in determining her choices and, consequently, her well-being. Saving and borrowing decisions, mortgage choices, stock market participation, and retirement planning are only some of the dimensions on which the agents' degree of financial sophistication can have a large impact. Moreover, the largely documented lack of financial literacy among the adult population increases the room for large-scale policy interventions whose welfare effects can be extremely important.

However, there is a dearth of sound causal evidence on the effects of financial education. The main challenge in this context is the potential endogeneity of financial literacy to the financial behavior of individuals. For instance, it is hard to disentangle whether financial market participation is the result of a higher level of financial sophistication or, *vice versa*, whether people who invest more in financial markets end up being more financially literate. We overcome this endogeneity

[1] We refer to financial literacy as the level of understanding of basic financial concepts. Alternative and more complete definitions are given by Lusardi and Mitchell (2014) according to whom financial literacy is "peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions." (p.6). Similarly, Atkinson and Messy (2012) define it as "[...] a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing." (p.14).

[2] Evidence on households' illiteracy was firstly provided by Bernheim (1995) with US data. More recently, Atkinson and Messy (2012) and Klapper et al. (2015) present analogous findings with data from the OECD INFE Pilot Study and the Standard & Poor's Global Financial Literacy Survey, respectively.

problem by designing a randomized experiment – in a sample of 260 young adults in Spain – in which we randomly induce an exogenous increase in the level of financial literacy of a subsample of the participants before asking them to evaluate a risky lottery. Specifically, participants are exposed to a double randomized treatment, thus being split into four groups. In a setup *à la* Holt and Laury (2002), respondents have to make twenty subsequent choices between the risky lottery and an increasing safe amount of money. We measure the value each respondent assigns to the lottery – that is, its certainty equivalent – as the safe amount for which she stops accepting the gamble and switches to the safe alternative. The risky lottery is presented either as a simple coin flip or as a financial asset, in this case being framed with financial concepts. Importantly, the payoffs and the probabilities are exactly the same for all participants, regardless of the way the lottery is presented. Then, we induce an exogenous increase in the level of financial literacy of half of the participants exposed to each of the two framings by explaining basic financial notions to them. Providing such teaching treatment to participants in the coin-toss group as well allows us to disentangle the effect of increasing financial literacy from any other behavioral response that the *teaching* might induce. In this setting, we measure the impact of both the financial framing and financial literacy on individuals' choices by comparing the average certainty equivalent in the four groups.

Two main results emerge from the experiment: i) the financial framing of the lottery makes it less desirable than an equivalent coin toss to individuals who do not receive the *teaching*; ii) the increase in financial literacy provided through the *teaching* has a positive and significant impact on the average value assigned to the financially framed lottery. Importantly, no effect of the *teaching* emerges among participants evaluating the coin toss, thus confirming that receiving the *teaching* does not alter individual behavior when the choice does not involve any financial concept. We also find that both the financial framing and the *teaching* affect the average comprehension of the structure of the lottery. Respondents report a lower understanding of the risky option when this is presented as a financial asset and are less able to correctly compute its maximum and expected gain. Enhancing financial literacy – through the provision of the *teaching* treatment – effectively improves both the self-assessed and the actual understanding of the financial lottery.

This evidence documents that a lack of financial knowledge leads to a systematic undervaluation of financial products that would otherwise be desirable to investors. Promoting financial literacy might reduce this distortion by enhancing the understanding of financial assets, thus increasing the value households assign to them. When put together, our experimental results have important policy implications. They show that financial literacy and an adequate comprehension of financial products play a major role at the time of investment decisions. Our findings contribute to explaining the puzzle of low stock market participation: relatively illiterate individuals might tend to avoid financial assets not because of their aversion to risk but mostly because of their inability to digest financial concepts. Furthermore, we show that even a short training in basic financial concepts can foster financial literacy and increase the value assigned to financial assets.[3] This result is in line with the evidence provided by Fort et al. (2016), who show how banks' information policies can effectively increase financial literacy and, in turn, the amount of financial assets held by investors. Our design involves a purposely simple binary lottery, whereas financial products are much more complex in reality. Any effect detected in our setting is therefore likely to be a lower bound for the impact that financial literacy would have in a more complex and realistic environment.

The experimental findings can be rationalized by ambiguity aversion. Illiterate agents face more ambiguity when making their investment decisions and therefore discount the value of financial assets if they are ambiguity averse. Thus, financial literacy can reduce the ambiguity faced at the time of the investment choice and increase investors' willingness to hold financial assets. In this sense, our paper is related to Dimmock et al. (2016), who show how ambiguity aversion can explain low stock market participation and the tendency of US investors not to own stocks. The authors also show that the negative effect of ambiguity aversion is stronger for illiterate agents, consistent with the findings from our experiment.[4] A model of ambiguity aversion and asset valuation – such as the one developed by Maccheroni et al. (2013) – in which the ambiguity faced by an investor decreases with her level of financial literacy, explains our main results as well as the positive link

[3]Relatedly, Brugiavini et al. (2015) and Lührmann et al. (2015) also show that short-term courses can significantly improve young adults' understanding of financial concepts.

[4]Other related works on ambiguity aversion and stock market participation include those by Easley and O'Hara (2010) and Izhakian and Yermack (2017).

between individual comprehension of the lottery and its certainty equivalent.

This paper mainly contributes to the empirical literature focusing on the relationship between financial literacy – or the lack thereof – and economic behavior. Lusardi and Mitchell (2014) provide an exhaustive summary of this vast body of literature. Financial literacy is found to be closely linked to several economic outcomes. It tends to be highly correlated with the activity in financial markets (Christelis et al., 2010; van Rooij et al., 2011)[5] as well as with the likelihood of undertaking retirement planning (Lusardi and Mitchell, 2007, 2011) and the ability of households to face negative macro-shocks (Klapper et al., 2013). A lack of financial knowledge is systematically correlated with many inefficient financial habits: illiterate agents underdiversify their portfolios and rebalance them less frequently;[6] they pay higher mortgage costs (Moore, 2003), fees and transaction costs and are more likely to use high-cost methods of borrowing (Lusardi and de Bassa Scheresberg, 2013; Lusardi and Tufano, 2015).[7]

Despite the abundance of empirical studies, few of them provide causal evidence of the role of financial literacy, mostly because of two identification threats: omitted variable bias and reverse causality. Both financial literacy and financial behavior are likely to be jointly affected by other variables that are not always observable – for instance, cognitive abilities or social class status – and whose omission can bias the estimated coefficients.[8] Additionally, financial literacy might be determined itself by financial behavior since frequent activity in financial markets might lead to higher levels of financial sophistication. Starting from Christiansen et al. (2008) – who use new university openings as an instrument for financial education – several authors address the endogeneity issue by applying instrumental variable techniques.[9] Still, this literature suffers from

[5] Similar evidence is also provided by Kimball and Shumway (2006). Additionally, Almenberg and Dreber (2015) show that women's lack of financial literacy might explain the gender gap in stock market participation. Relatedly, Cole et al. (2014) finds a causal effect of education, in general, on stock market participation.

[6] See Gaudecker (2015), Guiso and Jappelli (2009), Calvet et al. (2007) and Calvet et al. (2009).

[7] Campbell (2006) also documents that less-educated households tend to make financial mistakes more often than their more educated counterparts. Relatedly, Brown et al. (2016) provide evidence that financial education improves the debt behavior of young Americans.

[8] Theoretical foundations for the endogeneity of financial literacy come from Jappelli and Padula (2013) and Lusardi et al. (2017).

[9] See, for instance, Lusardi and Mitchell (2010), Sekita (2011), and Klapper et al. (2013) who instrument financial literacy with mandatory financial education in high schools, language ability and newspapers diffusion, respectively.

the lack of truly exogenous instruments.

Alternative approaches to IV estimations – mostly field and natural experiments – deliver mixed evidence. Several authors document that enhancing financial literacy can have an impact on saving and borrowing decisions (Sayinzoga et al., 2016; Haliassos et al., 2017), boost retirement planning (Song, 2015; Duflo and Saez, 2003), improve financial behavior (Drexler et al., 2014) and lead to higher accumulation of wealth (Bernheim et al., 2001). Conversely, other studies find no significant changes in the financial behavior of subjects exposed to financial literacy programs.[10]

Given these mixed results, sound causal evidence is needed to assess the impact of financial literacy on financial behavior. Additionally, digging deeper into the mechanisms behind this relation is crucial to understand the heterogeneity in the existing evidence and to design truly effective financial education programs. This paper follows this direction by investigating the effect of financial literacy on the subjective value that individuals assign to financial assets. The experimental results show that, by improving the understanding of financial products' fundamentals and characteristics, financial literacy can indeed reduce households' aversion to financial products whose returns, riskiness and costs are often hard to comprehend. Endowing small investors with adequate financial knowledge can therefore significantly increase their willingness to undertake financial investments and to participate in financial markets.

2 Experimental Design and Empirical Specification

Measuring the effect of financial literacy on individual behavior in financial markets is empirically challenging. For instance, agents who participate more in financial markets – because of their individual preferences – might end up being more financially literate than those who are less prone to do so. At the same time, individuals endowed with a greater stock of financial knowledge might be more inclined to purchase financial products than relatively illiterate agents.

[10] See, for instance, Choi et al. (2011) and Collins (2013). See also Hastings et al. (2013) for a more detailed review of the related studies.

We tackle this endogeneity concern by designing a randomized laboratory experiment with two randomized treatments in a two-by-two setting. We ask participants to evaluate a risky lottery, varying both the framing of the lottery and the respondents' level of financial literacy. Regarding the framing, the lottery is randomly presented either as a *simple* lottery (a coin toss) or as a *financial* lottery (a risky financial asset). In both cases the structure of the lottery – that is, the payoffs and the associated probabilities – is exactly the same. In particular, the gamble yields either 14 euros or nothing with equal probabilities. While the framing of the *simple* lottery does not involve any financial concept, a full comprehension of the *financial* one requires a few financial rudiments. Participants evaluating the financial lottery are offered a financial asset issued by a hypothetical company (AeroFlights SA). The financial asset has a current value of ten euros and yields a net return of 40% by the end of the experiment when participants get paid the final value of the asset unless the issuing company defaults. In this case, which occurs with a 50% probability, the final value is zero. The default probability is 50%. We elicit each participant's certainty equivalent of the risky lottery – presented either as a coin toss or as a financial asset – following Holt and Laury (2002). Participants make 20 sequential choices between the lottery and different safe amounts of money, ranging from 50 cents to 10 euros. Within this framework we measure the certainty equivalent for each participant as the safe amount at which she stops accepting the lottery and switches to the safe alternative.[11]

The second treatment we provide in our two-by-two design is a teaching of basic financial notions. The teaching treatment consists of a page explaining – in a simplified and stylized way – what a financial asset is, how to calculate returns and what occurs in the case of default of the issuer.[12] It therefore induces an increase in participants' level of financial literacy. Participants are randomly assigned to the teaching treatment regardless of the way the lottery is presented and receive it immediately before making their choices. The two treatment dimensions – *i.e.*, the financial framing and the *teaching* – define four different groups that are reported in Figure 1. Participants in group S evaluate the *simple* lottery and do not receive *teaching*; those in group F

[11] More precisely, we do not identify the precise individual certainty equivalent but rather a 50-cent interval in which it lies.

[12] See Appendix D for details about the information provided with the *teaching*.

evaluate the *financial* lottery and do not receive *teaching* either; finally, participants in groups ST and FT evaluate the *simple* and *financial* lottery, respectively, after receiving the *teaching*. The text of the lottery, as presented in each of the four groups, is presented in Appendix C.

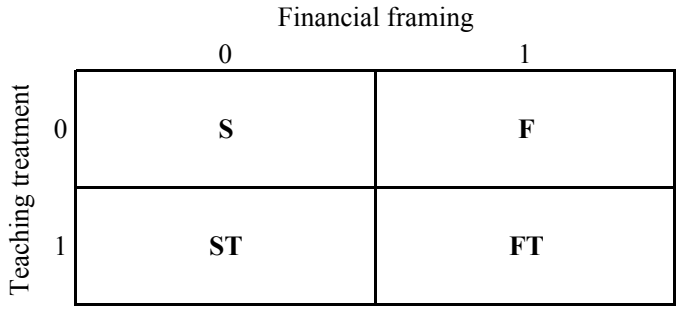


Figure 1: Experimental design

Within this two-by-two setting, we can test whether the financial framing affects the propensity to undertake risk by comparing the average certainty equivalent of the lottery for participants in groups S and F. Furthermore, we can assess the role of financial literacy when evaluating financial assets by comparing the behavior of respondents in groups F and FT. This design allows us to test in two ways whether any effect of the teaching treatment is due to an actual increase in the level of financial literacy of treated participants, rather than due to any other behavioral change induced by the provision of the teaching. First, we compare the average certainty equivalent of the lottery in groups S and ST. As long as the *teaching* is increasing financial literacy without altering the behavior of participants – for instance, by providing incentives for participants to concentrate more on their choices or making them more confident – no differences should emerge in the subsample of participants evaluating the coin-toss lottery. Additionally, we test whether the *teaching* actually increases the respondents' understanding of the risky lottery when financially framed. To measure both their perceived and objective understanding, we ask participants to report how much they think they understood about the structure of the lottery (on a scale from 0 to 10) and to indicate both the maximum and expected gain from the lottery. We then ask participants how useful they found the *teaching* when making their choices – on a scale from 0 to 10 – and which of the information provided with the *teaching* was the most useful.

Before the lottery choice, we present a set of ten financial literacy questions to assess the *ex ante* degree of financial sophistication of participants.[13] The questionnaire resembles the ones widely used to measure financial knowledge. It includes the standard questions about inflation, interest compounding and diversification, some more advanced questions about bonds, stocks, and options and two others requiring some numerical computations.[14] Our individual index of financial literacy equals the number of correct answers to the survey, thus ranging from 0 to 10. We use this index to measure the correlation between *ex ante* financial literacy and individuals' certainty equivalent and to check whether our sample reproduces the financial literacy patterns found in the existing literature.

Finally, at the end of the experiment, we ask participants to evaluate a risky and ambiguous lottery. Participants have to make twenty sequential choices between drawing a ball from a box containing green and blue balls in unknown proportion and a safe amount of money. When choosing the ball, participants can win either five euros if the ball is green or nothing otherwise. The safe amount offered ranges from 0.25 to 5 euros, and the certainty equivalent of this lottery is defined as the safe amount at which an agent switches from choosing the box to the safe alternative.[15] Since the lottery is the same in all groups and is shown at the end of the experiment, we compare the average certainty equivalent in the four groups to ensure that the treatments do not systematically alter respondents' attitude towards risk and ambiguity.

Given the experimental design, we infer the causal impact of financial literacy on the subjective value assigned to the financial asset by estimating the following equation:

$$CE_i = \alpha + \gamma TEACH_i + \delta FINLOT_i + \beta TEACH_i \times FINLOT_i + \phi X_i + \varepsilon_i, \tag{1}$$

where CE_i is the certainty equivalent of the risky lottery for individual i. $TEACH_i$ is a dummy variable that equals 1 when respondent i receives the *teaching* – that is, the exogenous increase

[13] Prior to the financial literacy test, we ask a few additional questions through which we collect personal information about age, income, education, etc. See Appendix A for a complete list of such questions.
[14] See Appendix B for the detailed list of the financial literacy questions used in the survey.
[15] The risky and ambiguous lottery offered to respondents is detailed at the end of Appendix C.

in her level of financial literacy. $FINLOT_i$ is an indicator that takes a value of one if individual i is given the financial lottery and zero otherwise. Finally, X_i is a vector of individual controls including, among others, gender, age, education, and income. In this specification, δ measures the effect of the financial framing on the certainty equivalent of the lottery. γ and β capture the impact of an increase in financial literacy on the value assigned to the coin-toss gamble and to the financial asset, respectively.[16]

The effect of financial literacy on the propensity of respondents to undertake the risky option – that is, the signs of β and γ – is *a priori* ambiguous. On the one hand, agents lacking financial literacy might be more averse to undertaking the risky lottery when it is presented as a financial asset (negative δ). On the other hand, less financially sophisticated agents might overestimate the value of the financial asset (positive δ) if they perceive it as less risky than the coin toss. In both cases, financial literacy can mitigate (amplify) the effect of the framing, in which case β would have the opposite (same) sign of δ. We expect γ to be statistically no different from zero: as long as the *teaching* affects participants' behavior only through an increase in financial literacy, the *teaching* should only be effective in the subsample of agents evaluating the *financial* lottery.

We then test whether the *teaching* effectively improves participants' understanding of the lottery by estimating the following equation:

$$UND_i = \alpha + \gamma TEACH_i + \delta FINLOT_i + \beta TEACH_i \times FINLOT_i + \phi X_i + \varepsilon_i, \tag{2}$$

where UND_i is either the self-assessed understanding of the lottery – how much participant i believes she understood about the structure of the lottery – or the objective understanding. In the latter case, UND_i is a dummy variable that equals 1 when the participant is able to compute the maximum and average gain achievable when choosing the risky option.[17] Thus, the δ coefficient

[16] We treat the outcome variable as continuous – being grouped in 20 small-sized intervals – and estimate Equation (1) using OLS, thus facilitating the interpretation of the estimated coefficients.

[17] More specifically, we use three different measures of objective understanding: i) an indicator variable that equals one if the participant can correctly compute the maximum win from the risky lottery; ii) an indicator variable that equals one if the participant can correctly calculate the average win; and iii) a dummy variable that equals one only if the participant is able to correctly report both.

identifies the difference in the understanding of the lottery due to the financial framing, and β measures whether – and how much – the *teaching* is effective in mitigating this distortion. Once again, we expect the γ coefficient to be statistically no different from zero.

3 Sample Description

The experiment was run at the Behavioral Sciences Laboratory (*BESLab*) of University Pompeu Fabra in Barcelona in December 2016. All participants were recruited via an E-mail invitation sent to all the subjects in the database of the *BESLab*. In total, eleven sessions with approximately 24 participants each occurred in a computerized classroom over two days. Each session lasted approximately 50 minutes including payment. Subjects' earnings ranged between 5 (the show-up fee) and 24 euros, with an average of 14.62 euros.

Our sample is composed of 260 participants randomly divided into four groups. Table 1 presents descriptive statistics of the respondents. Approximately 65% of participants are female, and their age ranges from 18 to 41, the average being 21. Only 24% of participants took a finance class before participating in the experiment, and approximately one-third of them studied either economics and finance or political sciences. When asked to assess their own level of financial knowledge on a scale from 0 to 10, participants reported an average level of 4. The average score in the financial literacy test equals 5.5. Table 1 also reports the differences in means of all of these variables and other individual characteristics among the different groups. No statistically significant differences emerge, confirming that groups are balanced across all the observed dimensions.

Figure 2 provides a graphical representation of the distribution of the financial literacy measure in the sample. The median score in the financial literacy test is 5. Approximately 20% of respondents correctly answer fewer than 4 questions, and only 5% score 10 out of 10. The share of correct answers is widely heterogeneous across questions. More than 70% of participants correctly answer to the questions about inflation and diversification and are able to define what a stock is. Conversely, less than 30% of them know about the relationship between bond prices and interest

rates. Additionally, no more than 40% of respondents are able to compute the expected value of a simple scratch card and the value of a property in two years, given the yearly percentage increase in its price. Between 50% and 60% of correct answers were collected on the remaining questions about interest rates, riskiness of stocks *vs.* bonds, call options and bond definition. These results are largely comparable with evidence from similar surveys in other countries. For instance, van Rooij et al. (2011) also find that only 24.6% of respondents in the 2005-2006 DNB Household Survey correctly answer the question about interest rate and bond prices (29% in our sample), while 63.3% know about diversification (70% in our case); 60.2% recognize that stocks are normally riskier than bonds (56.92% in our survey), and 55.5% know what a bond is (in our case, 58.08%).

By regressing our measure of *ex ante* financial literacy on the respondents' characteristics, we document that our sample replicates all of the usual patterns of financial literacy found by most of the previous studies in the literature.[18] The results of these regressions are reported in Table 2. The financial literacy score is significantly lower for females and tends to increase with family income (even though this effect vanishes when controlling for education). As one would expect, participants with a degree in economics and finance, as well as participants who took a finance course during their careers, score higher than the rest of the respondents. Similar results emerge when using self-assessed financial literacy as the dependent variable.

4 Results

The randomized nature of the experiment allows us to estimate the main effects of our treatments by simply comparing the average certainty equivalent in the four groups. Figure 3 provides a graphical representation of the two main findings. First, the financial framing reduces the average value assigned to the risky lottery by 20%. Second, participants exposed to the coin-toss lottery do not alter their behavior when receiving the *teaching*, while the latter effectively enhances the subjective value of the lottery when it is framed as a financial asset.

[18] See Lusardi and Mitchell (2014) for an exhaustive review of these works and a summary of their results.

Table 3 presents the main results from a systematic analysis of these effects. In particular, the table contains the estimated coefficients of Equation (1) under different specifications. In all of the regressions, the dependent variable is the certainty equivalent of the lottery, evaluated as the safe amount at which an individual starts preferring the safe amount to the risky alternative.[19] Column (1) presents the OLS estimate with neither controls nor fixed effects. In Columns (2) to (4), we include additional individual controls and session fixed effects. Finally, Column (5) reports the estimates from a Tobit model that accounts for the upper limit on the safe amount offered to participants, which is equal to ten euros.

The estimated coefficients presented in Table 3 confirm that both the financial framing and the teaching treatment have a sizable impact on the choice made by the individuals in our sample. In particular, receiving the *teaching* increases the value assigned to the financial asset by around 30% (+1.3 to +1.5 euros, depending on the specification). This increase completely offsets the negative effect due to the financial framing (between -0.93 and -1.09 euros). The sum of the two coefficients is indeed no statistically different from zero.[20] We do not find any evidence of an effect of the *teaching* on the behavior of agents facing the coin toss, as the estimated coefficient of $TEACH$ is zero. Consistent with the hypothesis that the value assigned to the financial lottery depends on financial literacy, we also find that both measures of pre-treatment financial literacy – the score in the test and the self-assessed one – are associated with higher certainty equivalents (even though the coefficient of the self-assessed measure is not significant). Lastly, it is worth noting that the Tobit coefficients do not differ from the OLS ones since most of the participants choose a switching point that is strictly included in the interval made available to them.

In Table 4, we also estimate the effect of the *teaching* on the probability of choosing the lottery for each of the twenty safe amounts offered. We run twenty different regressions – one

[19] We exclude from the analysis those individuals switching more than once in our setup *à la* Holt and Laury (2002), for whom we cannot observe a unique certainty equivalent. In our sample, these are approximately 25% of the observations. Importantly, the number of multiple switchers in the four groups is not systematically different, as shown in Table 1.

[20] Testing the joint significance of the estimated coefficients $\hat{\beta}$ and $\hat{\delta}$ from Equation 1 returns an F–statistic of .63 (P–value= .43). The F–statistic from the test $\hat{\beta} + \hat{\delta} = \hat{\gamma}$ is also statistically no different from 0 (F–statistic= .04 and P–Value= .84).

for each amount proposed – where the dependent variable is a binary indicator that equals one if an individual accepts the lottery. We present the estimates obtained when including multiple switchers in the sample (Panel A) and when excluding them (Panel B). The results from this additional analysis show that the *teaching* is particularly effective in increasing the probability of choosing the risky option when the safe amount ranges between 5.5 and 6.5 euros. This evidence is consistent with the fact that increasing financial literacy impacts the behavior of the marginal respondent. Neither the very risk-averse nor the very risk-loving investor is significantly affected by the provision of financial sophistication. Figure 4 illustrates this finding by plotting the share of respondents that opt for the risky alternative for each of the twenty safe amounts offered.

To test whether the increase in financial literacy translates into a better understanding of the lottery's structure, we estimate how the random assignment to the groups affects the individual comprehension of the gamble. We consider both a subjective – on a 0 to 10 scale – and three objective measures for the level of understanding: i) $Correct_1$ is a dummy that equals 1 when the participant correctly identifies the maximum win achievable when choosing the lottery (14 euros); ii) $Correct_2$ is a dummy that equals 1 when the participant correctly infers the average win from the lottery (7 euros); and finally, $Correct$ is a dummy that equals 1 when both questions are correctly answered.

Table 5 presents the results from estimating Equation (2). Consistent with the hypothesis that agents have difficulties in comprehending the characteristics of the lottery when it is presented as a financial asset, the coefficient of $FINLOT$ is negative and largely significant. The financial framing indeed reduces the subjective understanding of the lottery by more than 2 points (on a scale from 0 to 10) and the probability of correctly recognizing the expected (maximum) win from the risky lottery by 54% (62%). The *teaching* significantly improves both the self-assessed and the objective understanding of the framed lottery. The coefficient of $FINLOT \times TEACH$ is positive and significant in all columns. Receiving the *teaching* when the lottery is presented as a financial asset increases the reported understanding of the lottery by 1.7 to 1.8 points, thus nearly offsetting the negative effect of the financial framing. Additionally, it increases the share of participants who

are able to identify both the expected and maximum win from the lottery by 48%. Finally, the *teaching* given to agents facing the *simple* lottery does not significantly affect their understanding (none of the coefficients of $TEACH$ is significantly different from zero).[21] Hence, the *teaching* enhances financial literacy and increases individuals' ability to comprehend the payoffs and the riskiness associated with the *financial* lottery.

Additional evidence on the importance of the *teaching* comes from Figure 5, where we plot the distribution of the "usefulness" of the *teaching* for agents facing the *simple* and the *financial* lottery, respectively. As expected, the majority of respondents evaluating the *financial* lottery find the *teaching* particularly useful when making their choice and assign to it an average value of 6.8 out of 10, more than 3 points higher than that observed in the group of respondents evaluating the coin toss. Furthermore, when asked about which of the information provided with the *teaching* respondents find most useful, the majority of participants in the *simple* group find none of the notions of some use. In the *financial* group, the answer selected by most of the participants is "how to compute returns". Learning about returns was indeed useful when making the choice about accepting the lottery or not.[22]

Lastly, we analyze the participants' behavior when they are offered the risky and ambiguous lottery at the end of the experiment. We exploit these responses in a placebo test to check whether the provision of either of the two treatments alters agents' attitude towards risk and ambiguity. The results from this test are shown in Table 6. None of the coefficients is statistically different from 0, thus showing that receiving or not receiving the teaching treatment only affects individual behavior when making choices involving financial concepts and does not change individuals' underlying aversion towards risk and ambiguity.

[21] The F–statistics from testing the hypothesis $\hat{\beta}+\hat{\delta}=\hat{\gamma}$ on the estimated coefficients of Equation 2 when the measure of understanding considered is either the subjective understanding or *Correct* are both statistically no different from zero. The F–statistics are 0 (P–value=.98) and .34 (P–value=.56), respectively.

[22] Figure 6 provides a graphical representation of this result by showing the difference in the share of participants choosing each of the four possible answers in the *simple* and *financial* groups.

5 Financial Literacy and Ambiguity

The experimental evidence described so far shows that i) individuals lacking financial literacy tend to discount the value of financial assets and ii) increasing financial literacy reduces this distortion, thus promoting the willingness to invest in financial products. We also show that enhancing financial literacy – through the provision of the teaching treatment – increases participants' understanding of the payoffs and risks associated with financial assets. A possible explanation for these results relies on the concept of ambiguity aversion. Indeed, financial illiteracy is likely to increase the ambiguity faced by an investor when making her investment choice, thus lowering her willingness to undertake risk and purchase financial products. Reasonably, the probability of committing a mistake when evaluating a financial asset depends on the level of financial literacy of the investor, and illiterate agents have a higher probability of either overestimating or underestimating the value of the asset. When agents are not naive, they are perfectly aware of this higher probability of committing mistakes, and if ambiguity averse, the fear of overestimating a *bad* asset outweights the chance of underestimating a *good* one. As a result, illiterate agents have lower incentives to invest in financial markets when ambiguity averse.

The important role of ambiguity and ambiguity aversion as determinants of financial behavior has been highlighted by several recent studies. For instance, Dimmock et al. (2016) document a negative association between ambiguity aversion and stock market participation in a sample of US households. Similarly, Izhakian and Yermack (2017) provide evidence that ambiguity tends to increase early exercising of executives' stock options. Additionally, theoretical models of portfolio allocation under ambiguity, such as the ones developed by Easley and O'Hara (2010) and Maccheroni et al. (2013), show that investors discount the value of ambiguous assets.

Hence, our experimental results can be interpreted in this light. Consider, for instance, a decision maker who evaluates an ambiguous prospect according to the *smooth* model of decision under ambiguity proposed by Klibanoff et al. (2005). Maccheroni et al. (2013) show that the analogous of the Arrow-Pratt approximation for the certainty equivalent in the presence of ambiguity would

be:

$$C_i(h) = E_P(h) - \frac{\lambda_i}{2}\sigma_P^2(h) - \frac{\theta_i}{2}\sigma_\mu^2(E(h)), \tag{3}$$

where λ_i measures the decision maker's absolute risk aversion; θ_i is a parameter capturing her degree of ambiguity aversion; $\sigma_P^2(h)$ is a measure of the risk implied by the stochastic nature of the prospect h; and finally, $\sigma_\mu^2(E(h))$ is a measure of the ambiguity faced by the decision maker, that is, the uncertainty regarding the true model according to which h is distributed.[23]

This model delivers a simple and tractable approximation for the value that an agent assigns to a risky and ambiguous payoff, which can be easily brought into our experimental setting and allows us to link financial literacy to the value that an ambiguity averse agent assigns to a financial asset. Indeed, one can think that an individual evaluating a risky asset faces two sources of uncertainty: the first one is the physical uncertainty $\sigma_P^2(h)$, that is, pure *risk*, driven by the variability in the possible realizations of the payoff; the second one is model uncertainty $\sigma_\mu^2(E(h))$, that is, the *ambiguity* in the true probabilistic model according to which the final value of the asset is distributed. In this framework, financial literacy can impact the subjective value of financial assets by reducing the ambiguity the agent faces – that is, $\sigma_\mu^2(E(h))$ – and therefore increase the certainty equivalent of a risky financial asset for an ambiguity averse investor. In a nutshell, financial literacy increases the value that an ambiguity averse decision maker assigns to a risky asset since it enhances her ability to correctly identify the fundamentals of the asset, thus reducing the ambiguity she faces during the valuation process.

Consistent with this channel, we show that enhancing financial literacy through the provision of the teaching treatment increases the participants' understanding of the payoffs and risks associated with the *financial* lottery and makes it more valuable to participants. A positive association between the individual comprehension of the gamble and its certainty equivalent also emerges when focusing on the group of participants who evaluate the *financial* lottery and do not receive the *teaching*. Exploiting the across-subject heterogeneity in the comprehension of the *financial* lottery's structure,

[23] See Maccheroni et al. (2013) and Klibanoff et al. (2005) for details on the model of smooth ambiguity aversion and the derivation of robust mean-variance preferences.

we find that respondents who report a higher understanding – or correctly answer the questions on the maximum and average win achievable with the lottery – indeed assign a higher value to the financial asset.

Table 7 presents this additional evidence. Estimates in Columns (1) and (2) show that a one-unit increase in the self-assessed understanding scale is associated with an increase of approximately 30 cents in the certainty equivalent of the financial lottery. Furthermore, the estimates in Columns (3) and (4) document that agents able to compute the maximum (average) win from the lottery value it 2.29 (2.37) euros more than those who are not able to do so. Finally, correctly inferring both the maximum and average gain from the financial lottery increases the average certainty equivalent by 3.41 euros. Hence, understanding the structure of the lottery makes it significantly more valuable to participants.

6 Conclusions

Financial literacy potentially affects financial behavior in many ways. Providing causal evidence of these effects is challenging since financial literacy is likely to be endogenous to several individual characteristics that determine financial behavior. In this paper, we present results from a laboratory experiment designed to test whether an exogenous increase in financial literacy – induced by explaining basic financial notions – affects the value agents assign to a risky lottery presented as a financial asset.

Our results show that financial literacy plays an important role at the time of the investment decision. Framing the lottery with financial concepts, rather than presenting it as a simple coin toss, makes it more obscure to participants and reduces their willingness to take it. However, agents experiencing an exogenous increase in their level of financial literacy during the experiment value the financial lottery more than their untreated counterparts. Additionally, they report a higher understanding of the structure of the financially framed lottery. These results can be rationalized by ambiguity aversion: enhancing financial literacy can indeed reduce the ambiguity faced by retail

investors when evaluating financial assets, thus increasing the subjective value of the assets.

These results have important policy implications. Our findings show that financial illiteracy may lead to a systematic undervaluation of financial products because of the lack of an adequate comprehension of the payoffs and risks associated with the products. Therefore, endowing households with the tools to cut through the fog of financial markets – even through a concise training of basic financial concepts – can have a sizable impact on their willingness to invest in financial products.

References

Almenberg, J., Dreber, A., 2015. Gender, Stock Market Participation and Financial Literacy. Economics Letters 137, 140–142.

Atkinson, A., Messy, F.-A., 2012. Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study. OECD Working Paper on Finance, Insurance and Private Pensions No. 15, OECD.

Bernheim, B. D., 1995. Do Households Appreciate their Financial Vulnerabilities? An Analysis of Actions, Perceptions, and Public Policy. Tax Policy and Economic Growth pp. 1–30.

Bernheim, B. D., Garrett, D. M., Maki, D. M., 2001. Education and Saving:: The Long-term Effects of High School Financial Curriculum Mandates. Journal of Public Economics 80, 435–465.

Brown, M., Grigsby, J., van der Klaauw, W., Wen, J., Zafar, B., 2016. Financial Education and the Debt Behavior of the Young. Review of Financial Studies 29, 2490–2522.

Brugiavini, A., Cavapozzi, D., Padula, M., Pettinicchi, Y., 2015. Financial Education, Literacy and Investment Attitudes. SAFE Working Paper No. 86, Research Center SAFE - Sustainable Architecture for Finance in Europe, Goethe University Frankfurt.

Calvet, L. E., Campbell, J. Y., Sodini, P., 2007. Down or Out: Assessing the Welfare Costs of Household Investment Mistakes. Journal of Political Economy 115, 707–747.

Calvet, L. E., Campbell, J. Y., Sodini, P., 2009. Measuring the Financial Sophistication of Households. American Economic Review 99, 393–398.

Campbell, J. Y., 2006. Household Finance. Journal of Finance 61, 1553–1604.

Choi, J. J., Laibson, D., Madrian, B. C., 2011. $100 bills on the sidewalk: Suboptimal investment in 401 (k) plans. Review of Economics and Statistics 93, 748–763.

Christelis, D., Jappelli, T., Padula, M., 2010. Cognitive Abilities and Portfolio Choice. European Economic Review 54, 18–38.

Christiansen, C., Joensen, J. S., Rangvid, J., 2008. Are Economists More Likely to Hold Stocks? Review of Finance 12, 465–496.

Cole, S., Paulson, A., Shastry, G., 2014. Smart Money? The Effect of Education on Financial Outcomes. Review of Financial Studies 27, 2022–2051.

Collins, J. M., 2013. The Impacts of Mandatory Financial Education: Evidence from a Randomized Field Study. Journal of Economic Behavior & Organization 95, 146–158.

Dimmock, S. G., Kouwenberg, R., Mitchell, O. S., Peijnenburg, K., 2016. Ambiguity Aversion and Household Portfolio Choice Puzzles: Empirical Evidence. Journal of Financial Economics 119, 559 – 577.

Drexler, A., Fischer, G., Schoar, A., 2014. Keeping It Simple: Financial Literacy and Rules of Thumb. American Economic Journal: Applied Economics 6, 1–31.

Duflo, E., Saez, E., 2003. The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment. The Quarterly Journal of Economics 118, 815–842.

Easley, D., O'Hara, M., 2010. Microstructure and Ambiguity. Journal of Finance 65, 1817–1846.

Fort, M., Manaresi, F., Trucchi, S., 2016. Adult Financial Literacy and Households' Financial Assets: the Role of Bank Information Policies. Economic Policy 31, 743–782.

Gaudecker, H.-M. v., 2015. How Does Household Portfolio Diversification Vary with Financial Literacy and Financial Advice? The Journal of Finance 70, 489–507.

Guiso, L., Jappelli, T., 2009. Financial Literacy and Portfolio Diversification. CSEF Working Paper No. 212, Centre for Studies in Economics and Finance, University of Naples.

Haliassos, M., Jansson, T., Karabulut, Y., 2017. Financial Literacy Externalities. CEPR Discussion Paper No. DP12100, Centre for Economic Policy Research.

Hastings, J. S., Madrian, B. C., Skimmyhorn, W. L., 2013. Financial Literacy, Financial Education, and Economic Outcomes. Annual Review of Economics 5, 347–373.

Holt, C. A., Laury, S. K., 2002. Risk Aversion and Incentive Effects. American Economic Review 92, 1644–1655.

Izhakian, Y., Yermack, D., 2017. Risk, Ambiguity, and the Exercise of Employee Stock Options. Journal of Financial Economics 124, 65–85.

Jappelli, T., Padula, M., 2013. Investment in Financial Literacy and Saving Decisions. Journal of Banking & Finance 37, 2779–2792.

Kimball, M., Shumway, T., 2006. Investor Sophistication, and the Participation, Home Bias, Diversification, and Employer Stock Puzzles. Mimeo, University of Michigan.

Klapper, L., Lusardi, A., Panos, G. A., 2013. Financial Literacy and its Consequences: Evidence from Russia During the Financial Crisis. Journal of Banking & Finance 37, 3904–3923.

Klapper, L., Lusardi, A., Van Oudheusden, P., 2015. Financial Literacy Around the World. Global financial literacy excellence center report, George Washington University.

Klibanoff, P., Marinacci, M., Mukerji, S., 2005. A Smooth Model of Decision Making under Ambiguity. Econometrica 73, 1849–1892.

Lusardi, A., de Bassa Scheresberg, C., 2013. Financial Literacy and High-Cost Borrowing in the United States. NBER Working Paper No. 18969, National Bureau of Economic Research.

Lusardi, A., Michaud, P.-C., Mitchell, O. S., 2017. Optimal Financial Knowledge and Wealth Inequality. Journal of Political Economy 125, 431–477.

Lusardi, A., Mitchell, O. S., 2007. Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education. Business Economics 42, 35–44.

Lusardi, A., Mitchell, O. S., 2010. How Ordinary Consumers Make Complex Economic Decisions: Financial Literacy and Retirement Readiness. CFS Working Paper No. 2010/11, Center for Financial Studies (CFS).

Lusardi, A., Mitchell, O. S., 2011. Financial Literacy and Planning: Implications for Retirement Wellbeing. NBER Working Paper No. 17078, National Bureau of Economic Research.

Lusardi, A., Mitchell, O. S., 2014. The Economic Importance of Financial Literacy: Theory and Evidence. Journal of Economic Literature 52, 5–44.

Lusardi, A., Tufano, P., 2015. Debt Literacy, Financial Experiences, and Overindebtedness. Journal of Pension Economics and Finance 14, 332–368.

Lührmann, M., Serra-Garcia, M., Winter, J., 2015. Teaching Teenagers in Finance: Does it Work? Journal of Banking & Finance 54, 160–174.

Maccheroni, F., Marinacci, M., Ruffino, D., 2013. Alpha as Ambiguity: Robust Mean-Variance Portfolio Analysis. Econometrica 81, 1075–1113.

Moore, D. L., 2003. Survey of Financial Literacy in Washington State: Knowledge, Behavior, Attitudes, and Experiences. Washington State Department of Financial Institutions.

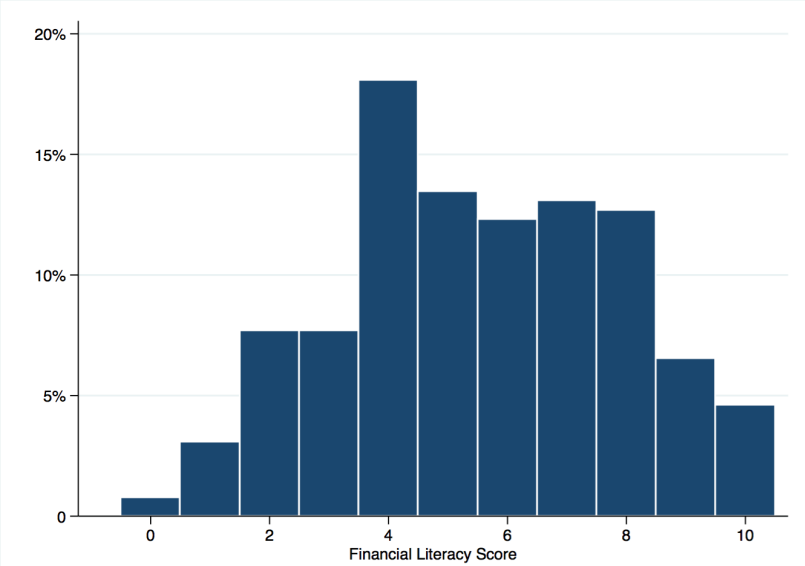
Sayinzoga, A., Bulte, E. H., Lensink, R., 2016. Financial Literacy and Financial Behaviour: Experimental Evidence from Rural Rwanda. The Economic Journal 126, 1571–1599.

Sekita, S., 2011. Financial Literacy and Retirement Planning in Japan. Journal of Pension Economics and Finance 10, 637–656.

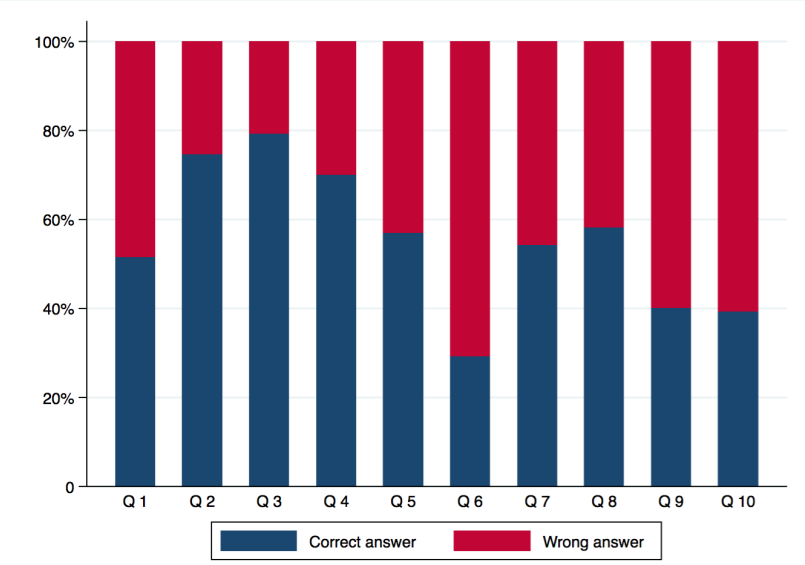
Song, C., 2015. Financial Illiteracy and Pension Contributions: A Field Experiment on Compound Interest in China. Mimeo, University of California, Berkeley.

van Rooij, M., Lusardi, A., Alessie, R., 2011. Financial Literacy and Stock Market Participation. Journal of Financial Economics 101, 449–472.

Figure 2: Distribution of pre-treatment financial literacy



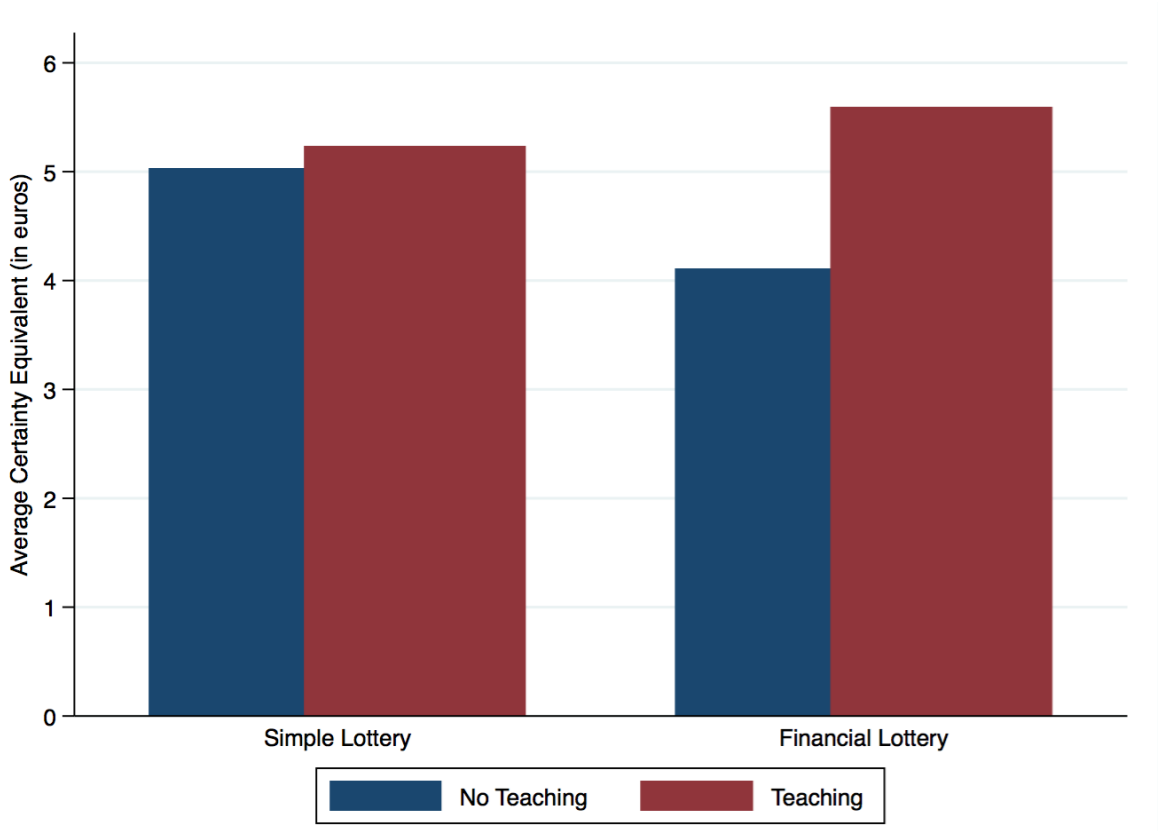
Aggregate



By question

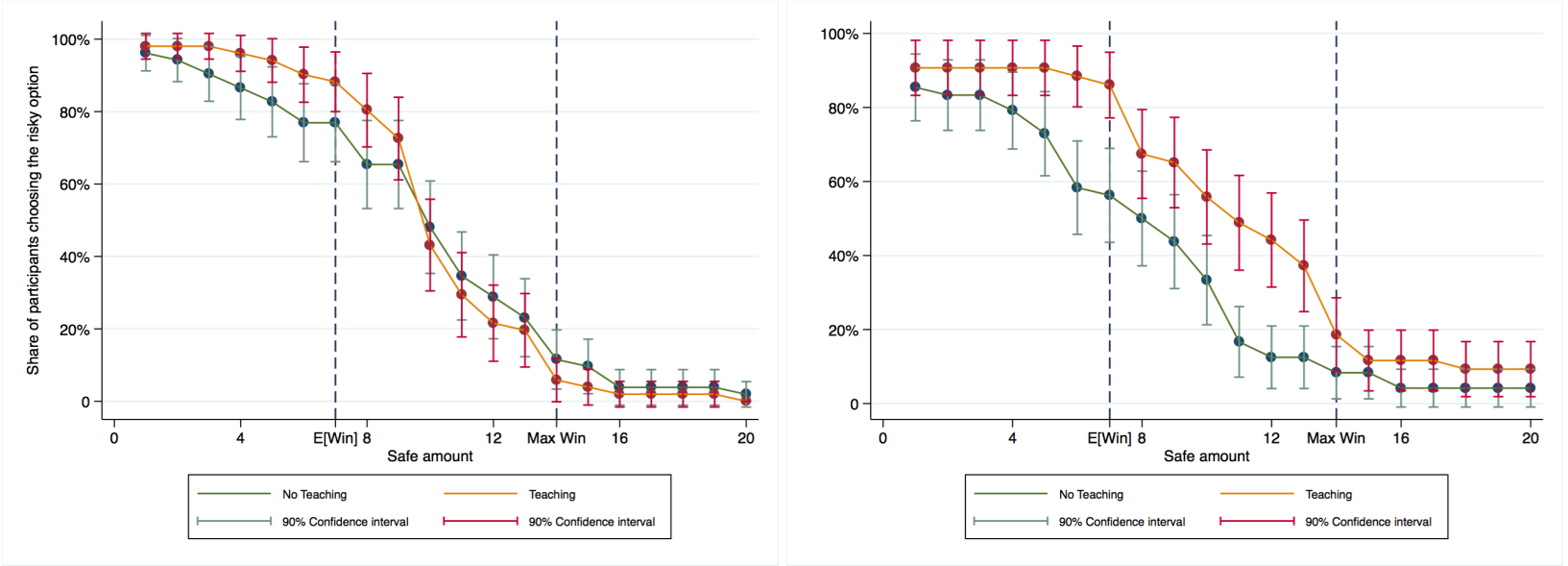
Note: The left panel of this figure plots the distribution of the score obtained in the financial literacy test. The score equals the number of correct answers and goes from 0 to 10. The right panel details the share of correct and wrong answers to each of the ten questions in the test.

Figure 3: Average certainty equivalent



Note: This figure plots the average certainty equivalent (in euros) of the risky lottery in each of the four groups. The certainty equivalent corresponds to the safe amount at which respondents stop choosing the risky option and switch to the safe alternative.

Figure 4: Heterogeneity in the probability of taking the risky lottery

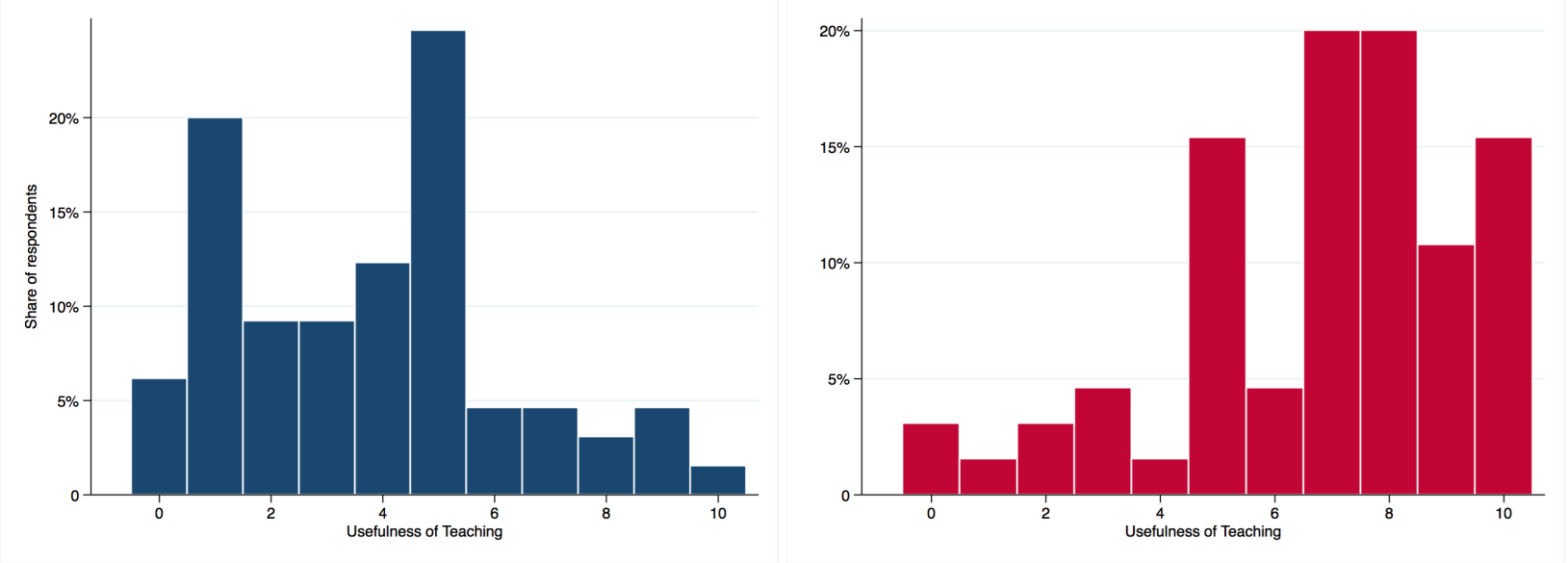


Simple lottery

Financial lottery

Note: This figure plots the probability of taking the risky lottery for each of the twenty safe amounts offered. The left (right) panel plots the share of respondents – receiving and not receiving the teaching treatment in orange e green, respectively – who take lottery when this is presented as a coin toss (financial asset).

Figure 5: Usefulness of the teaching treatment (1)

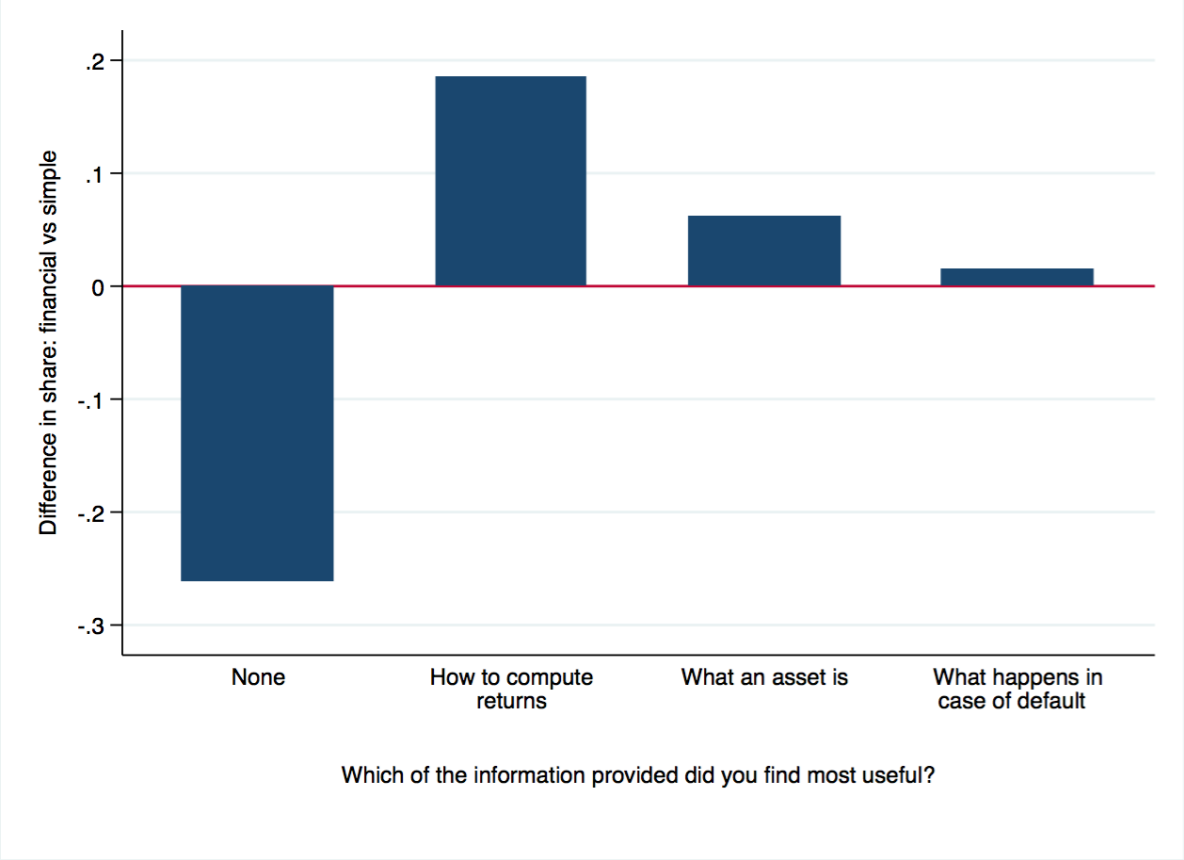


Simple lottery

Financial lottery

Note: This figure plots the distribution of the value – on a scale from 0 to 10 – assigned to the usefulness of the *teaching* by participants in the *simple*-lottery (left panel) and in the *financial*-lottery group (right panel).

Figure 6: Usefulness of the teaching treatment (2)



Note: This figure plots the difference in the share of respondents between the *financial*-lottery and the *simple*-lottery groups who indicated each of the four possible answers to the question *"Which of the information provided did you find most useful when making your choices?"*. Negative values correspond the a larger share of respondents picking that option in the *simple*-lottery group, whilst positive values result from a larger share of participants choosing that answer in the *financial*-lottery group.

Table 1: Summary statistics

Participants characteristics and mean differences between groups					
	Mean	St. Dev.	$\mu_F - \mu_S$	$\mu_{ST} - \mu_S$	$\mu_{FT} - \mu_S$
Female	0.65	0.48	-0.06	-0.03	0.05
Age	21.14	3.29	0.35	-0.77	-0.02
Work	0.32	0.47	-0.05	-0.06	-0.02
Working years	1.48	2.47	-0.02	-0.32	-0.29
Family Income > 80K euros	0.05	0.23	0.00	0.02	-0.02
Family Income 40K-80K euros	0.27	0.45	-0.03	0.00	0.14
Family Income < 40K euros	0.54	0.50	0.05	0.00	-0.11
Education level: High School Diploma	0.12	0.32	-0.02	0.09	0.03
Education level: Bachelor's Degree	0.74	0.44	0.02	-0.06	-0.06
Education level: Master	0.10	0.31	0.00	-0.03	0.02
Education level: PhD	0.02	0.15	0.02	-0.02	0.00
Field of studies: Economics/Finance/Pol. Sciences	0.35	0.48	0.00	-0.03	0.06
Field of studies: Humanities/Law	0.29	0.45	0.02	0.02	-0.02
Field of studies: Medicine/Biology/Psichology	0.12	0.33	0.00	-0.05	0.02
Field of studies: Other	0.24	0.43	-0.02	0.06	-0.06
Took a finance course	0.24	0.43	0.03	-0.03	0.05
Self-assessed Financial Literacy (0-10)	4.24	1.81	0.05	-0.54	-0.25
Financial Literacy score (0-10)	5.53	2.37	0.03	-0.08	-0.14
Multiple Switchers	0.25	0.44	0.06	-0.02	0.14
C.E. Ambiguous Lottery	2.68	1.06	0.12	0.17	0.10

NOTE: This table reports the summary statistics of the whole sample of participants, as well as the difference between the mean of each variable in group S (simple lottery with no *teaching*) and in the three other groups. *, ** and *** indicate that the mean difference is statistically different from 0 at the 99, 95 and 90% confidence level, respectively. *Financial Literacy score* is the score obtained in the financial literacy test, while *Self-assessed Financial Literacy* is the individual self-assessed level of financial knowledge. Both measures are on a 0 to 10 scale. Except for *Age* and *Working years* all of the other variables are binary indicators. *Multiple Switcher* is a dummy variable that equals 1 if we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery for a participant.

Table 2: Financial literacy patterns

Pre-treatment Financial Literacy				
	(1)	(2)	(3)	(4)
	Fin. Lit.	Fin. Lit.	Fin. Lit.	Self-ass. Fin. Lit.
Female	-1.189***	-1.150***	-0.899***	-0.578***
	(0.300)	(0.302)	(0.241)	(0.218)
Age	0.027	0.057	0.087	-0.074
	(0.043)	(0.068)	(0.062)	(0.056)
Work		-0.312	-0.244	-0.228
		(0.337)	(0.273)	(0.248)
Working years		-0.017	0.026	0.142**
		(0.092)	(0.077)	(0.069)
Family Income > 80K euros		0.615	0.497	1.082**
		(0.643)	(0.512)	(0.461)
Education level: Bachelor's Degree			0.492	0.453
			(0.351)	(0.317)
Education level: Master			0.645	0.856*
			(0.526)	(0.474)
Education level: PhD			0.274	0.454
			(0.914)	(0.823)
Field of studies: Economics/Finance/Pol. Sciences			2.735***	0.604**
			(0.321)	(0.289)
Field of studies: Humanities/Law			0.539*	-0.047
			(0.318)	(0.289)
Field of studies: Medicine/Biology/Psichology			0.613	-0.286
			(0.412)	(0.371)
Took a finance course			1.211***	1.062***
			(0.294)	(0.265)
Constant	5.733***	5.159***	2.385*	5.126***
	(0.957)	(1.366)	(1.240)	(1.117)
Mean Dep. Var.	5.531	5.531	5.531	4.236
Standard dev.	2.365	2.365	2.365	1.806
Observations	260	260	260	258
R^2	0.060	0.067	0.436	0.217

NOTE: This table reports the estimates of a set of regressions of the measures of pre-treatment financial literacy on participants' characteristics. The dependent variable in Columns (1) to (3) is the score obtained in the financial literacy test, while the dependent variable in Column (4) is the the individual self-assessed level of financial knowledge. Both measures are on a scale from 0 to 10. Except for *Age* and *Working years* all of the other variables are binary indicators. Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 3: Main results

Dependent Variable: Certainty equivalent of the risky lottery					
	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	OLS	Tobit
FINLOT	-0.925**	-1.096**	-1.062**	-1.088**	-1.091**
	(0.435)	(0.449)	(0.440)	(0.446)	(0.423)
TEACH	0.206	0.156	0.161	-0.021	0.143
	(0.429)	(0.440)	(0.431)	(0.446)	(0.415)
FINLOT×*TEACH*	1.282**	1.405**	1.398**	1.566**	1.458**
	(0.626)	(0.652)	(0.639)	(0.651)	(0.615)
Financial Literacy score (0-10)			0.259***		
			(0.095)		
Self-assessed Financial Literacy (0-10)				0.117	
				(0.102)	
Constant	5.029***	7.659***	6.786***	6.891***	8.215***
	(0.302)	(2.291)	(2.269)	(2.323)	(2.215)
Session FE	No	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	194	194	194	192	194
R-squared	0.059	0.266	0.299	0.272	

NOTE: This table reports the estimates of Equation (1). The dependent variable in all columns is the certainty equivalent of the risky lottery, defined as the safe amount at which an individual starts preferring the safe alternative to the lottery. *TEACH* and *FINLOT* are dummy variables that equal 1 if an individual receives the teaching treatment and the financial framing, respectively. *Financial Literacy score* is the score obtained in the financial literacy test, while *Self-assessed Financial Literacy* is the individual self-assessed level of financial knowledge. Both measures are on a 0 to 10 scale. Controls in Columns (2) to (5) include *Female*, *Age*, *Work*, and a set of binary indicators for a participant's level of education, field of study and family-income class. In Columns (2) to (5), we also include session fixed effects: a set of dummy variables identifying the different experimental rounds. In all regressions, we exclude those individuals for which we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery (*Multiple Switchers*). Estimates in Columns (1) to (4) are from OLS regressions, while a Tobit model – which accounts for the upper limit on the safe amount offered to participants (10 euros) – is assumed in Column (5). Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 4: Effect heterogeneity, by safe amount offered

Dependent Variable: Taking the risky lottery																				
Panel A: including *Multiple switchers*																				
	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00
FINLOT	-0.138***	-0.077	-0.185***	-0.138**	-0.062	-0.169**	-0.123	-0.169**	-0.200**	-0.154*	-0.138	-0.138*	-0.062	-0.046	0.000	0.108*	0.046	0.046	0.062	0.062
	(0.051)	(0.058)	(0.057)	(0.067)	(0.065)	(0.074)	(0.075)	(0.083)	(0.084)	(0.086)	(0.085)	(0.078)	(0.080)	(0.064)	(0.064)	(0.059)	(0.056)	(0.055)	(0.056)	(0.051)
TEACH	0.015	0.046	0.062	0.092	0.108*	0.138*	0.169**	0.123	0.092	-0.123	-0.046	-0.062	0.000	-0.046	-0.031	0.062	-0.031	-0.000	-0.000	-0.015
	(0.051)	(0.058)	(0.057)	(0.067)	(0.065)	(0.074)	(0.075)	(0.083)	(0.084)	(0.086)	(0.085)	(0.078)	(0.080)	(0.064)	(0.064)	(0.059)	(0.056)	(0.055)	(0.056)	(0.051)
FIN×TEACH	0.046	-0.015	0.092	0.077	-0.015	0.154	0.092	0.092	0.108	0.308**	0.262**	0.354***	0.154	0.215**	0.138	-0.000	0.062	0.108	0.031	0.200***
	(0.072)	(0.082)	(0.081)	(0.095)	(0.092)	(0.104)	(0.106)	(0.118)	(0.118)	(0.122)	(0.120)	(0.111)	(0.114)	(0.090)	(0.090)	(0.083)	(0.079)	(0.077)	(0.079)	(0.072)
Constant	0.954***	0.892***	0.908***	0.815***	0.815***	0.723***	0.692***	0.631***	0.646***	0.492***	0.415***	0.308***	0.292***	0.154***	0.138***	0.046	0.092**	0.062	0.077*	0.031
	(0.036)	(0.041)	(0.041)	(0.048)	(0.046)	(0.052)	(0.053)	(0.059)	(0.059)	(0.061)	(0.060)	(0.055)	(0.057)	(0.045)	(0.045)	(0.041)	(0.040)	(0.039)	(0.040)	(0.036)
Observations	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
R-squared	0.044	0.020	0.072	0.047	0.027	0.080	0.070	0.049	0.048	0.025	0.026	0.055	0.014	0.035	0.021	0.034	0.017	0.040	0.016	0.116
Panel B: excluding *Multiple switchers*																				
	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00
FINLOT	-0.107**	-0.109**	-0.071	-0.074	-0.098	-0.186**	-0.207**	-0.154	-0.216**	-0.147	-0.179*	-0.163*	-0.106	-0.032	-0.013	0.003	0.003	0.003	0.003	0.022
	(0.051)	(0.055)	(0.058)	(0.064)	(0.070)	(0.079)	(0.081)	(0.093)	(0.096)	(0.099)	(0.092)	(0.086)	(0.083)	(0.062)	(0.055)	(0.044)	(0.044)	(0.042)	(0.042)	(0.037)
TEACH	0.019	0.038	0.077	0.095	0.114*	0.133*	0.113	0.150	0.072	-0.049	-0.052	-0.073	-0.035	-0.057	-0.057	-0.019	-0.019	-0.019	-0.019	-0.019
	(0.051)	(0.054)	(0.057)	(0.063)	(0.069)	(0.078)	(0.080)	(0.092)	(0.094)	(0.098)	(0.090)	(0.085)	(0.082)	(0.061)	(0.054)	(0.043)	(0.043)	(0.042)	(0.042)	(0.037)
FIN×TEACH	0.034	0.036	-0.003	0.020	0.064	0.168	0.185	0.024	0.142	0.274*	0.374***	0.390***	0.282**	0.159*	0.090	0.093	0.093	0.070	0.070	0.071
	(0.074)	(0.078)	(0.083)	(0.092)	(0.101)	(0.114)	(0.117)	(0.134)	(0.138)	(0.143)	(0.132)	(0.124)	(0.119)	(0.089)	(0.080)	(0.064)	(0.064)	(0.061)	(0.061)	(0.053)
Constant	0.962***	0.942***	0.904***	0.865***	0.827***	0.769***	0.769***	0.654***	0.654***	0.481***	0.346***	0.288***	0.231***	0.115***	0.096**	0.038	0.038	0.038	0.038	0.019
	(0.036)	(0.038)	(0.040)	(0.044)	(0.049)	(0.055)	(0.056)	(0.065)	(0.066)	(0.069)	(0.063)	(0.060)	(0.057)	(0.043)	(0.038)	(0.031)	(0.031)	(0.029)	(0.029)	(0.026)
Observations	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194	194
R-squared	0.037	0.039	0.033	0.037	0.052	0.094	0.089	0.053	0.050	0.025	0.057	0.065	0.043	0.022	0.011	0.026	0.026	0.016	0.016	0.033

NOTE: This table reports the estimates from a set of regressions of the probability of taking the lottery, for each of the twenty safe amounts offered, on receiving the teaching treatment and the financial framing. In each column, the dependent variable is a binary indicator that equals 1 if an individual takes the lottery when offered the safe amount reported in the column header (ranging from 0.50 to 10 euros). *TEACH* and *FINLOT* are dummy variables that equal 1 if an individual receives the teaching treatment and the financial framing, respectively. In Panel A, we include those individuals for which we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery (*Multiple Switchers*). They are excluded in Panel B. Estimates in all columns are from OLS regressions. Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 5: Effects on the understanding of the lottery

Dependent Variable: Individual Comprehension of the Lottery					
	(1)	(2)	(3)	(4)	(5)
	Underst.	Underst.	$Correct_1$	$Correct_2$	Correct
FINLOT	-2.115***	-2.310***	-0.535***	-0.616***	-0.610***
	(0.416)	(0.401)	(0.090)	(0.086)	(0.087)
TEACH	-0.454	-0.644	-0.001	0.026	-0.105
	(0.410)	(0.392)	(0.088)	(0.085)	(0.085)
$FINLOT \times TEACH$	1.680***	1.826***	0.247*	0.563***	0.477***
	(0.599)	(0.582)	(0.131)	(0.125)	(0.126)
Financial Literacy score (0-10)		0.070	0.040**	0.038**	0.048**
		(0.087)	(0.019)	(0.019)	(0.019)
Constant	8.865***	7.859***	0.977**	0.764*	0.757*
	(0.289)	(2.064)	(0.464)	(0.445)	(0.447)
Session FE	No	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	194	194	194	194	194
R-squared	0.130	0.413	0.418	0.428	0.440

NOTE: This table reports the estimates of Equation (2). The dependent variable is the individual comprehension of the structure of the risky lottery, either self-assessed on a 0 to 10 scale – in Columns (1) and (2) – or objectively measured – in Columns (3) to (5). $Correct_1$ is a dummy that equals 1 when the participant correctly identifies the maximum win achievable when choosing the lottery (14 euros), $Correct_2$ is a dummy that equals 1 when the participant correctly infers the average win from the lottery (7 euros), and *Correct* is a dummy that equals 1 when both questions are correctly answered. *TEACH* and *FINLOT* are dummy variables that equal 1 if an individual receives the teaching treatment and the financial framing, respectively. *Financial Literacy score* is the score obtained in the financial literacy test, on a 0 to 10 scale. Controls in Columns (2) to (5), include *Female*, *Age*, *Work*, and a set of binary indicators for a participant's level of education, field of study and family-income class. In Columns (2) to (5) we also include a set of binary indicators for the different experimental rounds. In all regressions, we exclude those individuals for which we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery (*Multiple Switchers*). Estimates in all columns are from OLS regressions. Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 6: Placebo test

Dependent Variable: Certainty equivalent of the risky and ambiguous lottery					
	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	OLS	Tobit
FINLOT	0.043	-0.029	-0.029	-0.022	-0.003
	(0.215)	(0.236)	(0.236)	(0.233)	(0.220)
TEACH	-0.174	-0.121	-0.122	-0.236	-0.118
	(0.213)	(0.231)	(0.232)	(0.233)	(0.216)
FINLOT×*TEACH*	0.175	0.153	0.153	0.256	0.125
	(0.310)	(0.342)	(0.343)	(0.339)	(0.319)
Constant	2.654***	2.635**	2.647**	2.144*	2.882**
	(0.148)	(1.205)	(1.223)	(1.217)	(1.142)
Session FE	No	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	191	191	191	189	191
R-squared	0.007	0.132	0.132	0.148	

NOTE: This table reports the estimates from a set of regressions of the certainty equivalent of a risky and ambiguous lottery – presented at the end of the experiment, after the main lottery choice – on receiving the teaching treatment and the financial framing. The dependent variable in all columns is the safe amount at which an individual starts preferring the safe alternative to the risky and ambiguous lottery. *TEACH* and *FINLOT* are dummy variables that equal 1 if an individual received – during the main lottery choice – the teaching treatment and the financial framing, respectively. Controls in Columns (2) to (5) include *Female*, *Age*, *Work*, and a set of binary indicators for a participant's level of education, field of study and family-income class. In Columns (2) to (5), we also include a set of binary indicators for the different experimental rounds. In all regressions, we exclude those individuals for which we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery or that of the risky and ambiguous lottery (*Multiple Switchers*). Estimates in Columns (1) to (4) are from OLS regressions, while a Tobit model – which accounts for the upper limit on the safe amount offered to participants (5 euros) – is assumed in Column (5). Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 7: Individual understanding and the subjective value of the financial asset

Dependent Variable: Certainty equivalent of the *financial* lottery					
	Self-assessed understanding		Objective understanding		
	(1)	(2)	(3)	(4)	(5)
Understanding	0.271**	0.272*			
	(0.118)	(0.144)			
$Correct_1$			2.294**		
			(0.939)		
$Correct_2$				2.373***	
				(0.871)	
Correct					3.406**
					(1.390)
Constant	2.273**	-0.082	1.250	1.036	2.222
	(0.864)	(1.998)	(2.379)	(2.346)	(2.369)
Controls	No	Yes	Yes	Yes	Yes
Observations	48	48	48	48	48
R-squared	0.103	0.300	0.338	0.359	0.338

NOTE: This table reports the estimates from a set of regressions of the certainty equivalent of the *financial* lottery on the comprehension of its structure by participants. The sample is restricted to individuals who receive the financial framing but not the teaching treatment. The dependent variable in all columns is defined as the safe amount at which an individual starts preferring the safe alternative to the financial asset. $Understanding$ is the individual self-assessed comprehension of the structure of the risky lottery, on a 0 to 10 scale. $Correct_1$ is a dummy that equals 1 when the participant correctly identifies the maximum win achievable when choosing the lottery (14 euros), $Correct_2$ is a dummy that equals 1 when the participant correctly infers the average win from the lottery (7 euros), and $Correct$ is a dummy that equals 1 when both questions are correctly answered. Controls in all columns include *Female*, *Age*, *Work*, and a set of binary indicators for a participant's family-income class. In all regressions, we exclude those individuals for which we cannot uniquely identify, in the Holt and Laury (2002) setup, the certainty equivalent of the risky lottery (*Multiple Switchers*). Estimates in all columns are from OLS regressions. Standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

A General Questions

Qualtrics Survey Software

PART I:
GENERAL QUESTIONS

Age:

Gender:

- Male
- Female

Highest level of education (achieved or current):

- High School diploma
- Bachelor
- Master
- PhD
- Other

Field of study (if any):

- Economics or Finance
- Accounting or Management
- Law
- Humanities
- Political Science
- Sciences or Biology
- Mathematics or Physics
- Psychology
- Medicine
- Others

Have you ever taken a Finance course during your studies?

Yes	No
○	○

Are you currently working?

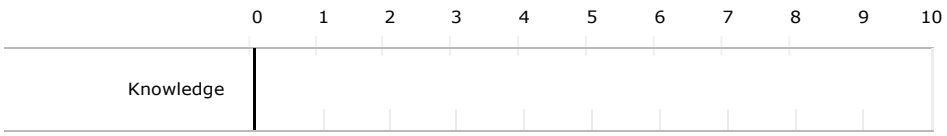
Yes	No
○	○

How many years have you been working?

Approximately, what is your family net income (after taxes) per year?

- ◯ less than €20,000
- ◯ between €20,000 and €40,000
- ◯ between €40,000 and €60,000
- ◯ between €60,000 and €80,000
- ◯ between €80,000 and €100,000
- ◯ More than €100,000
- ◯ Don't know

How would you rate, on a scale from 0 to 10, your financial knowledge?



B Financial Literacy Test

Qualtrics Survey Software

PART II:
FINANCIAL LITERACY TEST

Suppose you have €100 in a savings account and the interest rate is 20% per year. If you never withdraw money or interest payments, how much would you have in this account after 5 years?

More than €200	Exactly €200	Less than €200	Do not know
○	○	○	○

Imagine that the interest rate on your savings account is 1% per year and inflation is 2% per year. After 1 year, how much would you be able to buy with the money in this account?

More than today	The same as today	Less than today	Do not know
○	○	○	○

Which of the following statements is correct? If somebody buys the stock of firm B in the stock market:

- ○ He owns a part of firm B
- ○ He has lent money to firm B
- ○ He is liable for firm B's debts
- ○ None of the above;
- ○ Do not know

When an investor spreads his money among different assets, the risk of losing money:

Increases	Decreases	Stays the same	Do not know
○	○	○	○

Stocks are normally riskier than bonds. True or false?

True	False	Do not know
○	○	○

If the interest rate falls, what should happen to bond prices?

Rise	Fall	Stay the same	Do not know
○	○	○	○

When you buy a Call option on a stock, you are actually buying:

- ○ The right to sell a stock at a certain price in the future
- ○ The right to buy a stock at a certain price in the future
- ○ The obligation to sell a stock at a certain price in the future
- ○ The obligation to buy a stock at a certain price in the future
- ○ Do not know

Which of the following statements is correct? If somebody buys a bond of firm B:

- ◯ He owns a part of firm B
- ◯ He has lent money to firm B
- ◯ He is liable for firm B's debts
- ◯ None of the above;
- ◯ Do not know

Someone gives you a scratch card that allows you to win:

- €10 with probability 1/2
- €16 with probability 1/4
- €20 with probability 1/4

Compute and indicate the expected payout. If you do not know, write "Do not know".

Example: if your answer is €10, write:
"10"

If the value of an apartment increases by 5% per year and today it is worth €450,000, how much will it be worth in two years?

Indicate your answer below, in euros. If you do not know, write "Do not know".

Ex: if your answer is €20000, write:
"20000"

C Lottery Choice

Group S: *Simple* lottery with no *teaching*

PART III:
DECISION-MAKING

By completing the first two parts of the experiment you will be paid 5 euros.

Now you have the chance to earn an additional amount of money by choosing among different options in the next questions.

We offer you:

- **a safe amount of money; or**
- **the possibility of tossing a coin.**

If you opt for the coin toss, you will receive €14 if you get **head**, and €0 if you get **tail**.

You must make 20 sequential choices between tossing the coin and earning a safe amount of money. We propose you 20 possible amounts, from €0.50 to €10, as shown in the table below.

At the end of the experiment a row among the 20 will be randomly selected and your earnings will depend on the option you selected in that row. If you had chosen the coin toss, at the end of the experiment the computer will simulate the coin toss and you will be paid according to the **outcome (head or tail)**.

Example:

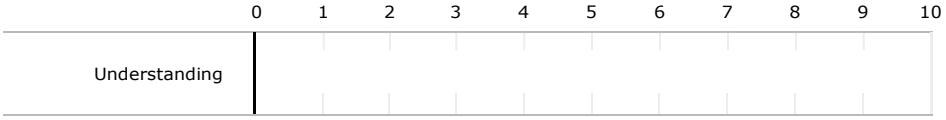
in the first row, we offer you €0.50. Would you prefer the €0.50 (the safe amount) or the coin toss? And in the second row, we offer you €1, would you prefer tossing the coin or getting €1 for sure? And so on...

(**YOU MUST MAKE A CHOICE IN EACH ROW!**)

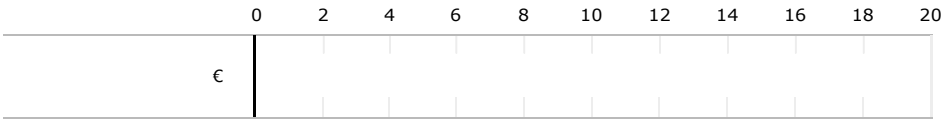
	The safe amount (on the left)	Tossing the coin
€0.50	○	○
	The safe amount (on the left)	Tossing the coin
€1.00	○	○
	The safe amount (on the left)	Tossing the coin
€1.50	○	○
	The safe amount (on the left)	Tossing the coin
€2.00	○	○
	The safe amount (on the left)	Tossing the coin
€2.50	○	○
	The safe amount (on the left)	Tossing the coin
€3.00	○	○
	The safe amount (on the left)	Tossing the coin
€3.50	○	○
	The safe amount (on the left)	Tossing the coin
€4.00	○	○
	The safe amount (on the left)	Tossing the coin
€4.50	○	○
	The safe amount (on the left)	Tossing the coin

€5.00	The safe amount (on the left)	Tossing the coin
€5.50	The safe amount (on the left)	Tossing the coin
€6.00	The safe amount (on the left)	Tossing the coin
€6.50	The safe amount (on the left)	Tossing the coin
€7.00	The safe amount (on the left)	Tossing the coin
€7.50	The safe amount (on the left)	Tossing the coin
€8.00	The safe amount (on the left)	Tossing the coin
€8.50	The safe amount (on the left)	Tossing the coin
€9.00	The safe amount (on the left)	Tossing the coin
€9.50	The safe amount (on the left)	Tossing the coin
€10.00		

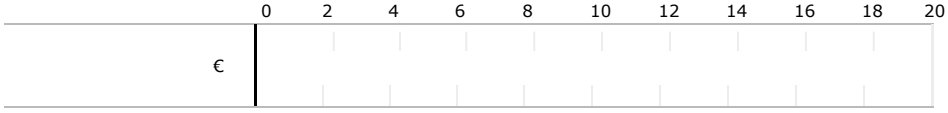
How confident are you, on a scale from 0 to 10 (where 0 is "I did not understand at all" and 10 is "I perfectly understood"), of having fully understood the previous question?



How much do you think one wins, on average, when tossing the coin?



How much do you think one can win, at most, when tossing the coin?



Group F: *Financial* lottery with no *teaching*

PART III:
DECISION-MAKING

By completing the first two parts of the experiment you will be paid 5 euros.

Now you have the chance to earn an additional amount of money by choosing among different options in the next questions.

We offer you:

- **a safe amount of money; or**
- **a risky financial asset issued by the company AeroFlights SA.**

The financial asset has a **current value** of €10 and, with 50% probability, it will yield a **net return** of 40% at the end of the experiment. With the remaining 50% probability, AeroFlights SA will **default** and the value of the financial asset will be €0.

You must make 20 sequential choices between the financial asset and earning a safe amount of money. We propose you 20 possible amounts, from €0.50 to €10, as shown in the table below.

At the end of the experiment a row among the 20 will be randomly selected and your earnings will depend on the option you selected in that row. If you had chosen the financial asset, you will get its **future value** (at the end of the experiment) that will be established by a market simulator according to the afore-stated probabilities.

Example:

in the first row, we offer you €0.50. Would you prefer the €0.50 (the safe amount) or the financial asset? And in the second row, we offer you €1, would you prefer the financial asset or getting €1 for sure? And so on...

(**YOU MUST MAKE A CHOICE IN EACH ROW!**)

	The safe amount (on the left)	The financial asset
€0.50	○	○
€1.00	○	○
€1.50	○	○
€2.00	○	○
€2.50	○	○
€3.00	○	○
€3.50	○	○

	The safe amount (on the left)	The financial asset
€4.00	○	○
€4.50	○	○
€5.00	○	○
€5.50	○	○
€6.00	○	○
€6.50	○	○
€7.00	○	○
€7.50	○	○
€8.00	○	○
€8.50	○	○
€9.00	○	○
€9.50	○	○
€10.00	○	○

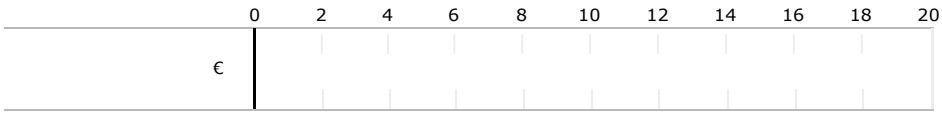
How confident are you, on a scale from 0 to 10 (where 0 is "I did not understand at all" and 10 is "I perfectly understood"), of having fully understood the previous question?

	0	1	2	3	4	5	6	7	8	9	10
Understanding											

How much do you think one wins, on average, when choosing the financial asset?

	0	2	4	6	8	10	12	14	16	18	20
€											

How much do you think one can win, at most, when choosing the financial asset?



Group ST: *Simple* lottery with *teaching*

PART III:
DECISION-MAKING

By completing the first two parts of the experiment you will be paid 5 euros.

Now you have the chance to earn an additional amount of money by choosing among different options in the next questions.

Before making your choices, please open the file "AdditionalInformation.pdf" by clicking here. In this file, you will find information that might be relevant and that might help when taking your choices. Please read them carefully!

We offer you:

- **a safe amount of money; or**
- **the possibility of tossing a coin.**

If you opt for the coin toss, you will receive €14 if you get **head**, and €0 if you get **tail**.

You must make 20 sequential choices between tossing the coin and earning a safe amount of money. We propose you 20 possible amounts, from €0.50 to €10, as shown in the table below.

At the end of the experiment a row among the 20 will be randomly selected and your earnings will depend on the option you selected in that row. If you had chosen the coin toss, at the end of the experiment the computer will simulate the coin toss and you will be paid according to the **outcome (head or tail)**.

Example:

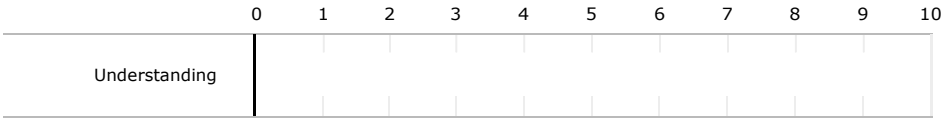
in the first row, we offer you €0.50. Would you prefer the €0.50 (the safe amount) or the coin toss? And in the second row, we offer you €1, would you prefer tossing the coin or getting €1 for sure? And so on...

(**YOU MUST MAKE A CHOICE IN EACH ROW!)**

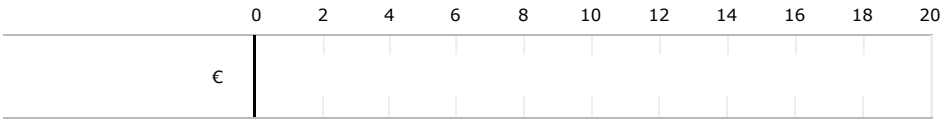
PS: Did you remember to open the file "AdditionalInformation.pdf"? If you think it contains information useful for your decisions and you want to re-open it, here it is.

[Note of the authors: the table is the same as in group S. For brevity, we omit it here.]

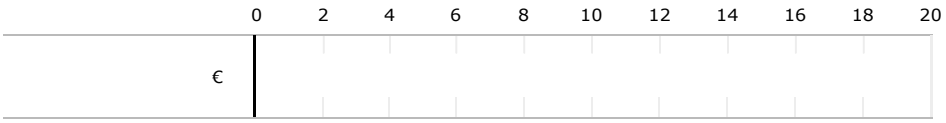
How confident are you, on a scale from 0 to 10 (where 0 is "I did not understand at all" and 10 is "I perfectly understood"), of having fully understood the previous question?



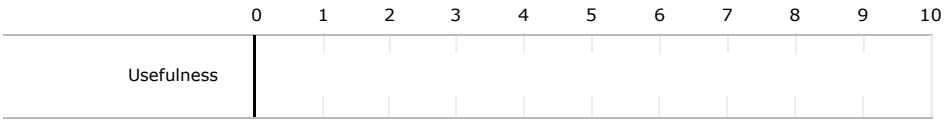
How much do you think one wins, on average, when tossing the coin?



How much do you think one can win, at most, when tossing the coin?



How useful did you find, from 0 to 10, where 0 is "useless" and 10 is "crucial", the information provided (what a financial asset is, how to compute returns...) for your decisions?



Which of the information provided did you find most useful when making your choices?

- ◯ What a financial asset is
- ◯ How to compute returns/future value
- ◯ What happens when the company issuing the financial asset defaults
- ◯ None of them

Group FT: *Financial* lottery with *teaching*

PART III:
DECISION-MAKING

By completing the first two parts of the experiment you will be paid 5 euros.

Now you have the chance to earn an additional amount of money by choosing among different options in the next questions.

Before making your choices, please open the file "AdditionalInformation.pdf" by clicking here. In this file, you will find information that might be relevant and that might help when taking your choices. Please read them carefully!

We offer you:

- **a safe amount of money; or**
- **a risky financial asset issued by the company AeroFlights SA.**

The financial asset has a **current value** of €10 and, with 50% probability, it will yield a **net return** of 40% at the end of the experiment. With the remaining 50% probability, AeroFlights SA will **default** and the value of the financial asset will be €0.

You must make 20 sequential choices between the financial asset and earning a safe amount of money. We propose you 20 possible amounts, from €0.50 to €10, as shown in the table below.

At the end of the experiment a row among the 20 will be randomly selected and your earnings will depend on the option you selected in that row. If you had chosen the financial asset, you will get its **future value** (at the end of the experiment) that will be established by a market simulator according to the afore-stated probabilities.

Example:

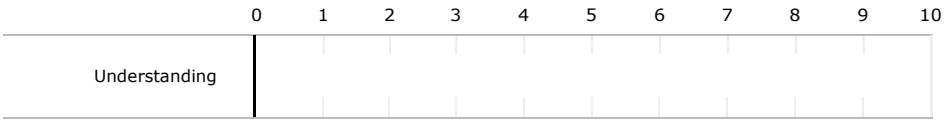
in the first row, we offer you €0.50. Would you prefer the €0.50 (the safe amount) or the financial asset? And in the second row, we offer you €1, would you prefer the financial asset or getting €1 for sure? And so on...

(**YOU MUST MAKE A CHOICE IN EACH ROW!)**

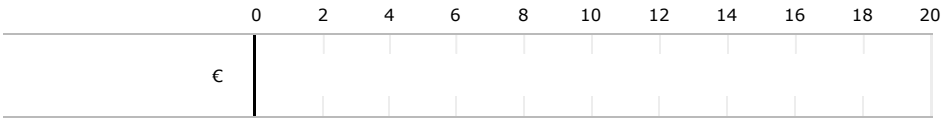
PS: Did you remember to open the file "AdditionalInformation.pdf"? If you think it contains information useful for your decisions and you want to re-open it, here it is.

[Note of the authors: the table is the same as in group F. For brevity, we omit it here.]

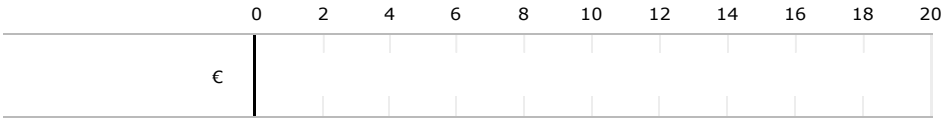
How confident are you, on a scale from 0 to 10 (where 0 is "I did not understand at all" and 10 is "I perfectly understood"), of having fully understood the previous question?



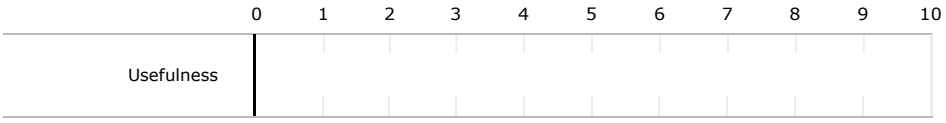
How much do you think one wins, on average, when choosing the financial asset?



How much do you think one can win, at most, when choosing the financial asset?



How useful did you find, from 0 to 10, where 0 is “useless” and 10 is “crucial”, the information provided (what an asset is, how to compute returns...) for your decisions?



Which of the information provided did you find most useful when making your choices?

- ○ What a financial asset is
- ○ How to compute returns/future value
- ○ What happens when the company issuing the financial asset defaults
- ○ None of them

Ambiguous Lottery

Finally, we present you the last question, where you have the chance to earn some extra money.

We offer you:

- a safe amount of money; or
- the possibility of drawing a ball from a box containing 10 balls;

The box contains green and blue balls in **unknown proportions**. If you draw a **green** ball from the box, you earn €5, if you draw a **blue** ball from the box, your get €0.

You must make 20 successive choices between drawing a ball or earning a safe amount of money. We propose you 20 possible amounts, from €0.25 to €5, as shown in the table below.

At the end of the experiment a row among the 20 will be randomly selected and your earnings will depend on the option you selected in that row. If you had chosen to draw a ball, at the end of the experiment the computer will simulate the draw, and you will be paid according to the **color** of the ball you get (green or blue).

Example:

in the first row, we offer you €0.25. Would you prefer the €0.25 (the safe amount) or drawing a ball? And in the second row, we offer you €0.50, would you prefer drawing a ball or getting €0.50 for sure? And so on…

(**YOU MUST MAKE A CHOICE IN EACH ROW!**)

	The Safe Amount (on the left)	Drawing a ball
€ 0.25	○	○
€ 0.50	○	○
€ 0.75	○	○
€ 1	○	○
€ 1.25	○	○
€ 1.50	○	○
€ 1.75	○	○
€ 2	○	○
€ 2.25	○	○
€ 2.50	○	○
€ 2.75	○	○
€ 3	○	○
€ 3.25	○	○
€ 3.50	○	○
€ 3.75	○	○
€ 4	○	○
€ 4.25	○	○
€ 4.50	○	○
€ 4.75	○	○
€ 5	○	○

D The Teaching

1. What is a financial asset?

A financial asset is a financial instrument, as for instance a stock or a bond, that can be traded in financial markets and whose value depends on the characteristics of the issuing company.

2. How do you compute the future value of a financial asset, given the rate of return?

The **future value** of a financial asset can be determined knowing its **rate of return**.

By multiplying the rate of return by the current value, you will know the return of the asset, that is, the increase in its value over time.

Therefore, the **future value** of a financial asset will simply be the sum of its current value plus the return.

Here you have a brief example: If an asset has a current value of 1000 euros, and its rate of return is 30%, the return will be: $1000 \times 30\% = 300$ euros. The future value of the asset will be $1000 + 300 = 1300$ euros. However, this will happen only if the company does not fail.

3. What happens if the issuer company defaults?

When the issuer company defaults, the financial asset will loose all of its value and therefore its future value will be **zero**.