Politecnico di Torino

Corso di Laurea Magistrale in Ingegneria Gestionale
A.a. 2025/2026
Sessione di Laurea Luglio 2026

Portfolio choices and risk attitude: an experimental approach

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Contents

1 Introduction

In recent years, the scientific literature has proposed an increasing number of articles and experiments regarding the cognitive biases to which investors are subject. In particular, this work focuses on three specific biases: Illusion of control, myopic loss aversion, and ambiguity aversion. In this work, a study will be conducted on a sample of 113 subjects. A questionnaire was administered to these subjects in which investment choices had to be made, and from their choices, it was analyzed whether biases that distorted their decisions were present or not.

In everyday life, and particularly during investments, we are always worried about making the best and most rational choice, but often our perceptions of events are distorted by our own minds. It is important to understand what phenomena we are subject to, when they emerge, and what consequences they have on our choices.

In this work, it is proposed to replicate an experiment already conducted in the past, but changing the boundary conditions. In the experiment that was conducted, participants are asked in a completely hypothetical way how much and what to invest in, but unlike previously conducted experiments, no real budget is provided to the participants, nor are they rewarded with real money gains. The sample taken is not composed of professional investors or experts in the field. It was chosen to conduct the experiment on a totally random and heterogeneous sample of participants, and an attempt was made to verify whether, under extreme conditions, the cognitive biases already known from previous literature would emerge.

To analyze the presence of the biases, two analyses were conducted: first, a qualitative analysis of the direct questions posed to the participants, and subsequently, a more detailed quantitative analysis of the participants' perceptions. In the first analysis, we directly analyzed which scenario was preferred both in terms of choice and in terms of capital invested by the participants, who could choose between a lottery strongly influenced by conditions that bring out the bias and a lottery where, instead, the presence of the bias was heavily penalized. In the second analysis, instead, we directly measured risk aversion, loss aversion and the subjective winning probabilities that emerged from the participants' choices. In this way, it was possible to map in a complete and punctual manner whether the biases were truly present and what the participants' psychological perceptions were towards the different lotteries.

The project is presented in 6 chapters. The first is the present introduction to the work. In the second, the main previous literature on the topic is summarized and explained, divided into three sections, one for each bias. In the third chapter, the preliminary concerns of the study are presented, and in particular, the structure of the questionnaire and how it is articulated in its three sections are explained; the econometric models used to model the participants' perceptions are explained, and finally, the limitations of the study and the particular conditions under which it was conducted are presented. In the fourth section, the collected data are reported. In the fifth section, the collected data are analyzed and the results of the study are presented. In the sixth and final section, a summary conclusion of what was found is proposed.

2 Related literature

2.1 Introduction

In 1738, with the St. Petersburg paradox, Daniel Bernoulli observed that a decision maker tends to make choices that maximize expected utility rather than monetary value. This principle was later confirmed by the Expected Utility Theory of Von Neumann and Morgenstern (1947), according to which, in a lottery that satisfies the conditions of completeness, transitivity, continuity, and independence, there exists a utility function and the decision maker always tends to maximize it. This theory was used to describe and understand how individuals make a decision.

However, since the formulation of this theory, it has been observed that in reality investment choices do not always maximize expected utility and that in many cases investors are subject to biases that influence their behavior and lead to the creation of non-optimal investment portfolios.

In particular, three phenomena have been identified by behavioral finance, namely: ambiguity aversion, illusion of control, and myopic loss aversion. These phenomena seem to distort the expected utility of the investor. In particular, over the last century, econometric models have been developed to model these phenomena and calculate a new expected utility. Some of the models developed are:

- Choquet expected utility (Schmeidler, 1989), where a weight called capacity is used so that events are weighted in a non-additive way;

- Maxmin expected utility, where instead of a single probability distribution the decision maker considers a set of possible distributions;

- Alpha-maxmin expected utility (Ghirardato et al., 2004), where a parameter alpha is added to the maxmin expected utility to capture the decision maker's position between the most optimistic and the most pessimistic scenario.

In this chapter, the literature about these three bias and all related implications are reported.

2.2 Ambiguity Aversion

The first references of ambiguity as a phenomenon in decision making date back to 1921 with Knight. Ambiguity describes a situation where probabilities are unknown and cannot be known. It differs from risk, where probabilities are known and can be measured. For Knight, it is precisely uncertainty that allows profit to be generated in real markets that are not perfectly competitive: entrepreneurs must decide how to allocate resources in the presence of unknown outcomes, and it is through these decisions that they generate profit.

In the presence of ambiguity, where probabilities are not known, it is no longer possible to mathematically compute a utility function for the decision maker. This raises the fundamental question of how decisions are made in reality, where we are always in a condition of ambiguity. A first contribution to this question was provided by Savage in 1954: he assumed that when probabilities are not objective, individuals behave as if probabilities were subjective (Subjective Expected Utility). This representation is supported by axioms on preferences: completeness, transitivity, Sure-thing principle (that is, if option A is preferred to option B in all states of the world, then option A is also preferred when probabilities are unknown), non-triviality, and continuity. Given these axioms, for Savage it is possible to construct a utility function with subjective probabilities that is maximized in the choice. The Sure-thing principle is the weakest axiom of this theory, as it assumes that uncertainty does not modify the perception of events by the decision maker.

Ellsberg (1961), through a series of experiments, showed instead that individuals tend to prefer all those lotteries where probabilities are known compared to those where ambiguity is present. His experiment consisted in choosing whether to bet on a red or black ball as the outcome of drawing a ball from an urn, with a choice between two urns: one with 50% red balls and 50% black balls, and one with red and black balls in unknown proportions. Most individuals prefer to bet on the urn with known probabilities regardless of the chosen color, thus violating the Sure-thing principle. This phenomenon of preferring the urn with known composition is precisely ambiguity aversion.

After Ellsberg, the Savage model was overcome, and the need for a new model that also takes into account ambiguity aversion emerged. A new model was therefore developed by Maccheroni, Marinacci, and Rustichini which, similarly to that of Gilboa and Schmeidler, does not consider a single subjective probability but a set of possible probabilities (multiple priors), and also introduces a "penalty" for scenarios considered less plausible by the decision maker, thus integrating ambiguity aversion into a mathematical model and providing a better prediction of individual choices.

Ellsberg's experiment has been replicated many times, always identifying the presence of this bias. An example is the 1993 study by Sarin and Weber, where participants had to buy and sell assets simulating a competitive market, and the result was that ambiguous assets were sold at a discount compared to risky assets. Halevy (2007) also conducted experiments similar to Ellsberg's, obtaining the same results. In Halevy's work, it was also highlighted that ambiguity aversion depends on the degree of ambiguity.

For example, in the supplier-customer relationship, lower supplier performance leads to a more variable outcome for the customer, who faces more ambiguous situations and, very intuitively, prefers suppliers with better performance. However, not only actual supplier performance affects the degree of ambiguity perceived by the customer, but also their level of trust influences ambiguity perception and the presence of bias in the customer's choices (Gao and Driouchi, 2018). More ambiguity leads the client to less externalization. Similarly to the supplier-customer trust relationship, the quality of the information available to the decision maker can also influence the perception of ambiguity (Epstein and Schneider, 2008).

Including ambiguity aversion in investors' portfolio choices, also considering the heterogeneity of the phenomenon and the degree of uncertainty, allows for a much better prediction of investor behavior (Ahn, David et al., 2014). It is observed that investors' cautious choices in the presence of ambiguity lead to the creation of more conservative and suboptimal portfolios. Ambiguity aversion also plays a central role in influencing the stochastic covariance of assets (Bergen et al., 2018). In the presence of ambiguity (for example due to unclear information), higher returns are required to convince investors to invest in more ambiguous assets.

If investors' decisions are made sequentially, such as repeated investments over time, it has been observed that knowing the outcome between decisions reduces the level of ambiguity perceived, suggesting that both the quantity of information and familiarity influence the phenomenon. A perceived competence in the task could also decrease the level of ambiguity perceveid (Heath and Tversky 1991).

Quality and quantity of information, degree of trust, competence and familiarity all affect the level of ambiguity. However, as with risk aversion, the level of ambiguity aversion is subjective and also depends on the individual. Many studies have attempted to identify demographic characteristics and how they influence ambiguity aversion. For example, a 2017 study on Chinese adolescents conducted by Li showed that individuals from more rural and less wealthy backgrounds are more ambiguity averse, suggesting that wealth influences the degree of tolerated uncertainty. However, other studies show opposite results or weak correlations. Uncertain results also emerge regarding education, marital status, and age, as different studies lead to different conclusions.

There seems instead to be a link between gender and ambiguity aversion: both in Borghans (2009) and in Friedl, Ring, and Schmidt (2017), it has been shown that women are more ambiguity averse than men. Male subjects therefore tend to invest more in ambiguous situations.

From a psychological perspective, ambiguity aversion seems to come from a higher cognitive challange for human brain when probabilties are known and prefering the ones with know probablity even if they are not the most convenient. Also it seems ambiguity aversion is influenced by social judgment, as shown in Trautmann et al. (2008), where ambiguity aversion decreases significantly when social judgment is not present, suggesting that they are more prone to the take risks and act less cautiosly when nobody can examine their outcome. Ambiguity aversion is therefore a real phenomenon that explains both differences in portfolio choices among investors and why, in certain conditions such as poor information, low familiarity, and low trust, assets must offer higher returns to convince investors to purchase them.

2.3 Illusion of control

The illusion of control is a cognitive bias in which individuals tend to have the illusion of having a higher probability of winning.

The first studies conducted on the existence of this bias date back to the 1970s. For example, in 1977 Fischhoff et al. conducted an experiment in which students were asked to answer general knowledge questions and, for each answer, to indicate their level of confidence. It emerged that the most confident students were not those who had given the most correct answers. A few years later, in another experiment by Weinstein, students were asked to provide a probability percentage for the occurrence of certain events; the results showed that students tended to perceive it as more likely that negative events would happen to others than to themselves. It therefore seems that the perception of probabilities related to events is strongly distorted when the individual makes a choice that concerns them personally or relates to their abilities. We are, in a sense, unable to see reality objectively when we feel involved.

Langer in 1975 tried to identify the factors involved in this bias. In a two-person gamble, individuals perceive lower probabilities of winning the more their rival appears capable and skilled. At the same time, they estimate higher probabilities of winning if they make a direct choice that influences events (for example choosing the lottery ticket number or rolling a die themselves), if they are familiar with the events or have already practiced that type of lottery. Therefore, feeling involved or capable or having familiarity leads to overestimating the probability of winning. However, having greater knowledge of randomness and greater awareness of real probabilities would reduce the phenomenon of illusion of control (Presson and Benassi 1996). Also having greater knowledge of the factors actually involved in phenomena would reduce the bias (Fellner, 2004).

Even superstitious beliefs or believing to have special abilities in activities with completely random outcomes (for example having a personal ritual for rolling a die) lead to illusion of control (Davis et al. 2000).

In the stock market, this overestimation of probabilities of success leads investors to invest more, invest in riskier assets, and invest more frequently, causing the investor to take more risk and also to fail to create optimal investment portfolios and to have worse performance (Fenton-O'Creevy et al). However, having more aggressive positions supported by a false illusion of control could in some cases lead investors to obtain higher payouts (Kyle and Wang 1997). Regardless of payoff, in markets with more confident shareholders there is higher price volatility and higher trading volumes (Biais et al., 2005). Furthermore, when investors can choose which stocks to invest in, as in pension funds, there is a tendency to diversify less, and this in some cases can also lead to worse performance.

Using a strategy can also facilitate the presence of illusion of control (Satinover and Sornette, 2009).

The illusion of control varies from individual to individual. In particular, men seem to be more prone to it (Barber and Odean, 2001). It also appears to be more present where the level of education is higher, the individual is older, and the individual has more experience (Bhandari et al. 2006).

At a psychological level, illusion of control arises from the sphere of self-confidence and in particular the protection of it. However, as shown by Yarritu et al. in 2014, the illusion also seems to arise when the individual does not make the choices personally but observes others making the choices; therefore, even without social motivations or personal self-esteem reasons, individuals may assign incorrect probabilities to reality due to a misperception of contingencies.

2.4 Myopic Loss Aversion

Another cognitive phenomenon that leads decision makers to take decisions that do not maximize expected utility is Myopic Loss Aversion (MLA). MLA is composed of two main components:

- **Loss aversion**, that is, being more sensitive to losses than to gains
- **Myopia**, that is, being more focused on the short time than the long time

These two preferences, which influence each other, lead investors to prefer less risky and shorter-term assets over riskier long-term assets that would yield higher returns.

Loss aversion was introduced in 1979 with Prospect Theory (Kahneman and Tversky, 1979), showing how a utility function that weights gains and losses differently could better explain investors' behavior in reality. However, loss aversion alone does not explain why the equity premium (i.e., the difference in returns between stocks and bonds, namely the extra return of stocks) is so high. In other words, stocks tend to have much higher returns than expected, and the reason is that investors perceive stocks as much riskier than they actually are and hence require a higher return to hold them (Mehra and Prescott, 1985).

In addition to loss aversion, to explain the equity premium puzzle it is necessary to introduce the second component of MLA: checking returns too frequently or having a shorter investment horizon. Benartzi and Thaler (1993) demonstrated the presence of this preference and showed that if returns were evaluated no more than once a year, investors would be indifferent between stocks and bonds. They also showed that the frequency of evaluation significantly affects risk aversion.

The investment horizon also plays a key role. In fact, MLA is observed both with more frequent feedback and with longer investment horizons to a similar extent (Fellner et al., 2008).

The first study on MLA that combined the two phenomena (loss aversion and preferences over feedback frequency) was conducted by Thaler (1997). He studied how risk aversion changes when losses are made more or less salient and when feedback is provided at different time intervals. It was found that both short-term feedback and more salient losses lead to greater risk aversion. Therefore, decision makers make suboptimal choices and must be incentivized to choose options they perceive as riskier. In general, MLA explains well why investors, under certain conditions, tend to make more conservative choices (Bellemare et al., 2005).

To reduce MLA, it would be optimal to provide less frequent feedback. However, feedback that contains less information or more aggregated information also appears to reduce risk aversion. Moreover, providing participants with more information and instructions about short term investments seems to mitigate the phenomenon. The way information is presented may also play a key role: bar charts and interval visualizations appear to increase optimism and risk-taking (Wesslen et al., 2021). Using technologies that allow investors to see not only short-term results but also long-term projections could help reduce MLA (Looney and Hardin, 2009).

Individual characteristics may also influence the extent to which MLA is present. More neurotic individuals appear to be less subject to MLA and more willing to take risks. Extroverted, agreeable, and conscientious individuals tend instead to be more prone to MLA and more risk-averse (Durand et al., 2016). Women seem to be more subject to MLA than men (Iturbe-Ormaetxe et al., 2016), although other studies do not find a significant relationship between gender and the bias (Durand et al., 2016). Another relevant factor is age: the bias is almost absent in adolescents and appears to increase with age (Glätzle-Rützler et al., 2015).

When decisions are made in groups rather than individually, the effect of MLA is reduced and groups tend to be more risk-taking (Sutter et al., 2007). Although financial knowledge reduces risk aversion and MLA, it has been shown that the phenomenon, in a milder form, is also present among professional traders (Haigh et al., 2002).

From a psychological perspective, early losses may affect an individual's sense of self-efficacy and lead to greater risk aversion. Indeed, MLA appears to be more prevalent among individuals with low self-esteem, pessimism, and anxiety (Hopfensitz and Wranik, 2008).

2.5 Relationship Between Ambiguity Aversion, Illusion of Control and Myopic Loss Aversion

There is no single, formally established framework that directly links ambiguity aversion, illusion of control, and myopic loss aversion. However, all three biases aim to explain why investors deviate from the standard assumption of expected utility maximization.

Both ambiguity aversion and myopic loss aversion contribute to explaining why individuals display more conservative behavior and higher levels of risk aversion under specific conditions. In particular, ambiguity aversion arises when probabilities are unknown, while myopic loss aversion is driven by frequent evaluation of outcomes and a stronger sensitivity to losses than gains.

In contrast, illusion of control operates in the opposite direction. It tends to reduce perceived risk in situations characterized by familiarity, superstition, or the presence of choices that appear to influence outcomes. As a result, investors may underestimate risk and engage in more aggressive behavior.

Overall, these biases can be interpreted as different mechanisms affecting risk perception. Depending on the context, the perceived level of risk may be either higher or lower than its objective level, leading investors to underinvest or overinvest in risky assets.

Some studies provide partial evidence of interactions among these biases. For instance, Iturbe-Ormaetxe et al. (2016) show that ambiguity can influence myopic loss aversion, suggesting that higher levels of ambiguity may amplify behavioral biases. Similarly, Dominiak et al. find that the relationship between ambiguity and dynamic decision-making is heterogeneous: increased feedback over time reduces ambiguity aversion for some individuals, while it remains unchanged for others.

Further insights are provided by Presson and Benassi (1996), who show that more frequent feedback can increase the illusion of control. This finding suggests a potential link between myopic loss aversion and illusion of control, as feedback frequency plays a central role in both biases. Interestingly, since these biases affect risk perception in opposite directions, they may partially offset each other.

Individual characteristics also appear to play a role. Younger individuals tend to exhibit lower levels of myopic loss aversion, but they are also generally less prone to illusion of control, which may result in more cautious behavior overall. Gender differences have also been observed: women tend to be more subject to myopic loss aversion and less prone to illusion of control, leading to more conservative investment behavior.

In conclusion, although these biases are not formally unified within a single theoretical model, they can be interpreted as interacting distortions of risk perception. Their combined effect varies across individuals and contexts, making it difficult to construct a universal model of behavior under uncertainty.

3 Preliminary Concerns

The core research objective of this study is to empirically verify the presence of specific cognitive biases—namely, illusion of control, ambiguity aversion, and myopic loss aversion—within a heterogeneous sample of participants.

To investigate these phenomena, the experimental design follows the experiment led by Charness and Gneezy (2012) ("Portfolio choice and risk attitudes: An experiment"). The experiment was implemented via a structured questionnaire developed on the Qualtrics platform. While maintaining the baseline portfolio choice framework, the experimental treatments for the illusion of control and ambiguity aversion sections were specifically modified to suit the analytical requirements of this study. The questionnaire is divided into three distinct operational sections.

3.1 Experimental Sections

3.1.1 Section 1: Illusion of Control

This section draws inspiration from the experimental framework of Langer (1975) to test the illusion of control by allowing participants to choose between active involvement in selecting their winning numbers or passive random assignment.

In each round, participants are endowed with an initial budget of €100 and must decide what portion, $x \in [0, 100]$, to allocate to a risky asset. The risky asset's outcome is determined by the roll of a standard six-sided die. Three out of the six numbers are designated as winning numbers. If the die lands on a winning number, the invested capital yields a gross return of 2.5 times the invested amount ($2.5x$); otherwise, the investment is lost entirely. The remaining uninvested budget ($100 - x$) accumulates wealth at a risk-free return rate of 5%.

The section consists of four sequential rounds:

- **Round 1:** The participant chooses whether to manually select the three winning numbers or have them randomly assigned.
- **Round 2:** The three winning numbers are strictly chosen by the participant.
- **Round 3:** The winning numbers are strictly predetermined and assigned by the experimenter.
- **Round 4:** The participant faces the same choice as in Round 1, but selecting their own numbers incurs a fixed fee of €5, which is subtracted from the round's total payoff.

3.1.2 Section 2: Ambiguity Aversion

The second section evaluates ambiguity aversion using a framework that closely replicates Charness and Gneezy's setup and mimics the classic Ellsberg paradox.

Participants choose an investment amount $x \in [0, 100]$ from a €100 budget and bet on the color of a ball drawn from one of two urns containing red and black balls. Urn A has a known distribution (50% red and 50% black). Urn B has an ambiguous composition unknown to the participants.

If the drawn ball matches the color chosen by the participant, the investment yields a gross return of 2.5 times the invested amount; otherwise, the capital is lost. The uninvested budget earns a 5% risk-free return.

This section is structured across four rounds:

- **Round 1:** The participant freely chooses whether to draw from Urn A or Urn B.
- **Round 2:** The ball is strictly drawn from Urn A (known distribution).
- **Round 3:** The ball is strictly drawn from Urn B (ambiguous distribution).
- **Round 4:** The participant chooses between the two urns, but selecting the known distribution (Urn A) incurs a fixed €5 fee subtracted from the round's payoff.

3.1.3 Section 3: Myopic Loss Aversion

To optimize data collection efficiency, this section features e reduced number of rounds. Participants are asked to allocate equivalent total budgets across two separate investment plans with different evaluation frequencies.

- **Plan 1 (Low Frequency):** A single, single-stage round with a total investment budget of €400.
- **Plan 2 (High Frequency):** Consists of four separate, sequential rounds, each endowed with an individual budget of €100.

The baseline asset follows a six-sided die roll where the participant selects two winning numbers, representing a winning probability of 33.3%. A winning roll yields a gross return of 2.5 times the investment, whereas a loss results in total forfeiture. Uninvested funds earn a 5% risk-free return. Subjects participate in both plans sequentially, starting with Plan 1 followed by the four consecutive rounds of Plan 2.

The winning probabilities across the experimental blocks are summarized in Table 1.

Table 1: Summary of Winning Probabilities by Bias Treatment

Cognitive Bias	**Experimental Condition**	**Winning Probability**
Ambiguity Aversion	Urn A (Known Composition)	50.0%
	Urn B (Unknown Composition)	Ambiguous
Illusion of Control	Self-Chosen Numbers	50.0%
	Assigned Numbers	50.0%
Myopic Loss Aversion	Plan 1 (Single Block)	33.3%
	Plan 2 (4 Repeated Rounds)	33.3%

3.2 Analytical Framework

Following data collection, empirical analyses will be conducted using a two-pronged strategy. First, a qualitative analysis will verify the statistical presence of the behavioral biases. Second, a quantitative structural analysis utilizing Choquet Expected Utility (CEU) theory will measure how subjective probability distortions warp expected utility evaluations.

3.2.1 Qualitative Analysis Criteria

The parametric hypotheses for the behavioral treatments are structured as follows:

- **Ambiguity Aversion:** Evaluates whether Urn A is preferred in Round 1; compares whether total allocations are higher in Round 2 than in Round 3; and tests whether participants prefer to draw from Urn B or pay the €5 premium to use Urn A in Round 4.

- **Illusion of Control:** Measures whether active number selection is preferred over assignment in Round 1; checks if allocations are significantly larger in Round 2 relative to Round 3; and evaluates the willingness to pay a €5 premium to retain choice autonomy in Round 4.

- **Myopic Loss Aversion:** Compares whether aggregate investment levels are significantly higher in Plan 1 compared to the sum of Plan 2; and tests for feedback sensitivity by evaluating if investments decrease in Plan 2 immediately following a realized loss.

3.2.2 Quantitative Structural Modeling (Choquet Expected Utility)

The quantitative analysis builds on the assumption that individuals select an investment level x that maximizes their subjective expected utility. For the Ambiguity Aversion and Illusion of Control tasks, we assume a Constant Relative Risk Aversion (CRRA) utility function specified as:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma} \quad (\text{for } \gamma \neq 1) \tag{1}$$

where γ denotes the coefficient of relative risk aversion. By deriving the first-order conditions of the expected utility function with respect to the chosen investment level x, γ can be structurally estimated for each participant via:

$$\gamma = \ln\left(\frac{1.38(100-x)^{1.05}}{(100-x)^{1.05}+2.5x}\right) \tag{2}$$

To avoid asintotic behavior for the highest risk seekin behavior γ was considered equal to -3.

By solving the system under the Choquet Expected Utility framework, we extract a distortion parameter δ, which captures how the participant's subjective perception warps the objective expected values based on experimental treatments. For the first two experimental sections, the structural formulation yields an identical expression for δ:

$$\delta = \frac{((100-x)\cdot 1,05)^{-\gamma}}{((100-x)\cdot 1,05+2,5x)^{-\gamma}} \cdot \frac{1}{\left(1,38+\frac{((100-x)\cdot 1,05)^{-\gamma}}{((100-x)\cdot 1,08+2,5x)^{-\gamma}}\right)} \tag{3}$$

For the section on myopic loss aversion, it was decided to draw inspiration from the utility function used by Kahneman and Tversky in their 1979 work, namely:

$$u(x) = \begin{cases} x^{0.88} & \text{in case of win} \\ \lambda(-x)^{2.25} & \text{in case of loss} \end{cases}$$

Let I be the invested sum and N be the non-invested sum. The total initial endowment is given by $(I+N)$.

The Status Quo benchmark (R) represents the guaranteed return if the participant decides not to risk anything, keeping the entire endowment safe at the 1.05 multiplier:

$$R = 1.05\cdot(I+N) = 1.05\cdot I + 1.05\cdot N$$

If the participant wins, the total payoff is $2.5\cdot I + 1.05\cdot N$. To find the psychological deviation x_{win}, we subtract the Status Quo benchmark from this payoff:

$$x_{win} = (2.5\cdot I + 1.05\cdot N) - R$$

$$x_{win} = (2.5\cdot I + 1.05\cdot N) - (1.05\cdot I + 1.05\cdot N)$$

Since $+1.05\cdot N$ and $-1.05\cdot N$ cancel each other out, we get:

$$x_{win} = 2.5\cdot I - 1.05\cdot I = (2.5-1.05)\cdot I = 1.45\cdot I$$

If the participant loses, the invested sum yields nothing, meaning the total payoff is only the return on the non-invested sum $(1.05 \cdot N)$. To find the psychological deviation x_{loss}, we subtract the Status Quo benchmark from this payoff:

$$x_{loss} = (1.05 \cdot N) - R$$

$$x_{loss} = (1.05 \cdot N) - (1.05 \cdot I + 1.05 \cdot N)$$

Here, the $+1.05 \cdot N$ and $-1.05 \cdot N$ cancel out, leaving:

$$x_{loss} = -1.05 \cdot I$$

:

Setting the Status Quo as the reference point, it is possibile to calculate expected utility function cosidering the probabiility of winning and losing:

$$EU = 0.33 \cdot (1.45 \cdot I)^{0.88} - 0.67 \cdot \lambda \cdot (1.05 \cdot I)^{2.25}$$

To find the optimal investment condition for the participant, we take the first derivative of the expected utility with respect to the invested sum I ($\frac{dEU}{dI}$):

$$\frac{dEU}{dI} = 0.88 \cdot 0.33 \cdot 1.45^{0.88} \cdot I^{-0.12} - 2.25 \cdot 0.67 \cdot \lambda \cdot 1.05^{2.25} \cdot I^{1.25}$$

By setting the first-order condition equal to zero ($\frac{dEU}{dI} = 0$) to identify the optimal choice equilibrium, we obtain:

$$\lambda = \frac{1.219}{2.511 \cdot I^{1.37}}$$

The parameter λ will be considered fixed for the experimenter and obtained as mean of the values obtained for each partecipant. To avoid for investors who have invested 0, the invested sum was considered equal to 1 euro.

To isolate the subjective probability weight δ while treating the loss aversion coefficient λ as a fixed parameter, it was choosen to use the mean of lambda value for each partecipant, then the Subjective Expected Utility using Choquet integral simpliefied in a win-lose case was used: (EU)

$$EU = \delta \cdot (1.45 \cdot I)^{0.88} - (1 - \delta) \cdot \lambda \cdot (1.05 \cdot I)^{2.25}$$

The equation was derivated and put equal to zero, eventually, solving for δ provides the explicit econometric formula to compute individual probability weights

$$\delta = \frac{2.511 \cdot \lambda \cdot I^{1.37}}{1.219 + 2.511 \cdot \lambda \cdot I^{1.37}}$$

The last part of the analysis will consist of verifying whether the biases have any statistical correlation with the gender, age, economic status, and education level of the subject. To observe this correlation, χ^2 test will be utilized.

3.3 Limitations of the study

A first limitation is represented by the population sample. It was decided to conduct this survey on a sample of 113 participants. The sample is small and highly heterogeneous; it does not statistically represent a population.

Another limitation is given by the fact that the portfolio choices were based on a virtual budget. Participants were symbolically provided with a budget of 1,200 euros. This undoubtedly led to riskier choices (in fact, the majority of the participants proved to be risk-seeking) than those that would have been made if the money had actually been provided to the participants. Therefore, they cannot represent the behavior of investors who invest real sums of money, and often their own money. In the experiment by Charness, Gary, and Uri Gneezy, which was actually carried out in an American faculty, some students were randomly selected from among the participants and were actually paid the monetary equivalent of their winnings. Unfortunately, it was not feasible for this study to provide the participants with money, and their behavior will certainly be influenced by this.

Another limitation of the study consists in its structure. In the section on myopic loss aversion, the expected return of the investment turns out to be negative; in fact:

$$r = \frac{(2{,}5 \times 0{,}33 + 0 \times 0{,}66) - 1}{1} = -0{,}175$$

If there had been any risk-averse participants, they would never have invested in this lottery, opting out of participating in the game.

Another limitation is provided by the economic model used to analyze the results. In the Choquet-CRRA model—meaning the application of the Choquet integral to the CRRA utility—the calculated psychological probabilities of winning (i.e., what the probabilities of winning would need to be for the individual to take part in the investment) are inevitably flattened downward for risk-seeking subjects by the strongly negative risk aversion coefficient. In the results chapter, this mathematical model will lead to counter-intuitive but mathematically consistent results.

4 Data

The questionnaire (reported in Appendix A) was released on May 27th and the data were collected on May 3rd. A total of 113 fully completed questionnaires were collected.

4.1 Participants' Demographic Data

36% of the participants are male and 60% of the participants are female (Graphic 1). 7% of the participants are between 0 and 25 years old, 27% of the participants are between 25 and 50 years old, and 30% of the participants are over 50 years old (Graphic 2). Only 5% of the participants defined themselves as rich and 8% as poor, while the remaining ones are neither rich nor poor (Graphic 3). 35% of the participants obtained a high school diploma, while 24% obtained a bachelor's degree and 36% obtained a master's degree (Graphic 4).

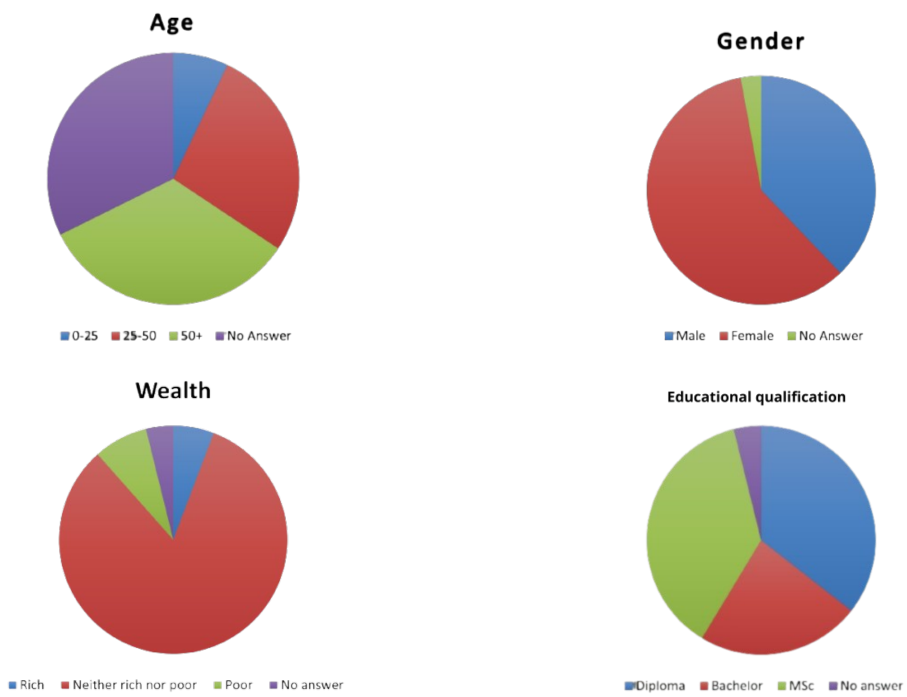

Figure 1: Graphic 1, 2, 3 and 4

4.1.1 Demographic Analysis

It was also led a demographic analysis to prove if the bias have correlation with gender, age, study degree and wealth.To check the correlation it was used the real investment trend, so it was checked if when they have invested more between the option with bias and the option without bias.

4.1.2 Bias presence and demographic distribution

Following the tables with the frequencies of the demographic traits of individuals and the presence of the bias.

Table 2: Distribution of Bias by Gender

Gender	BIAS	No Bias
Male	13	28
Female	32	36

Table 3: Distribution of Bias by Wealth Level

Wealth	Bias	No Bias
Rich	1	5
Medium	43	50
Poor	1	9

Table 4: Distribution of Bias by Age Group

Age	Bias	No Bias
0-25	5	3
25-50	10	20
50+	17	17

Table 5: Distribution of Bias by Educational Degree

Degree	Bias	No Bias
Diploma	19	21
Bachelor	11	17
MSC	15	26

4.1.3 Parameters of the study and demographic distribution

A further demographic analysis was led specifically in λ , δ and γ. In the following table the frequencies of values and the respective demographic caratheristic are repoterd.

In table 6 the Delta was split in three ranges: lower than 0.1, between 0.1 and 0.2 and higher than 0.2.

Table 6: Ambiguity aversion and delta

DELTA AND GENDER			
	0-0,1	**0,1-0,2**	**0,2+**
Male	13	13	15
Female	34	15	19
DELTA AND WEALTH			
	0-0,1	**0,1-0,2**	**0,2+**
Rich	2	4	0
Medium	42	20	31
Poor	3	4	3
DELTA AND AGE			
	0-0,1	**0,1-0,2**	**0,2+**
0-25	2	5	1
25+50	13	9	8
50+	15	9	10
Delta and Degree			
	0-0,1	**0,1-0,2**	**0,2+**
Diploma	20	8	12
Bachelor	9	11	8
MSC	17	10	14

In table 7 the delta was split in three different ranges (this time the ranges are higher due to higher optimism in the myopic loss aversion section): lower than 0.4, between 0.4 and 0.6 and higher than 0.6.

Table 7: Myopic loss aversion and delta

DELTA AND GENDER			
	0-0,4	**0,4-0,6**	**0,6+**
Male	1	5	35
Female	4	10	54
DELTA AND WEALTH			
Wealth	**0-0,4**	**0,4-0,6**	**0,6+**
Rich	0	0	6
Medium	4	14	75
Poor	1	1	8
DELTA AND AGE			
Age	**0-0,4**	**0,4-0,6**	**0,6+**
0-25	0	1	7
25+50	0	3	27
50+	1	3	30
Delta and Degree			
Degree	**0-0,4**	**0,4-0,6**	**0,6+**
Diploma	2	3	35
Bachelor	1	3	24
MSC	2	9	30

In table 8, the delta was split in three ranges: lower than 0.1, between 0.1 and 0.2 and higher to 0.2.

Table 8: Illusion of control and delta

DELTA AND GENDER			
	0-0,1	**0,1-0,2**	**0,2+**
Male	16	9	16
Female	31	15	22
DELTA AND WEALTH			
Wealth	**0-0,1**	**0,1-0,2**	**0,2+**
Rich	2	3	1
Medium	42	19	32
Poor	3	2	5
DELTA AND AGE			
Age	**0-0,1**	**0,1-0,2**	**0,2+**
0-25	3	3	2
25+50	10	8	12
50+	15	9	10
Delta and Degree			
Degree	**0-0,1**	**0,1-0,2**	**0,2+**
Diploma	19	8	13
Bachelor	12	8	8
MSC	16	8	17

In table 9 lambda was split in three ranges: the first one lower than 0.0001, the second one beetween 0.0001 and 0.0002 and the last one higher than 0.0002.

Table 9: LAMBDA

Loss aversion and gender			
	<0,0001	**>0,0001 AND <00002**	**>0,0002**
Male	12	15	14
Female	14	30	24
Loss aversion and wealth			
	<0,0001	**>0,0001 AND <00002**	**>0,0002**
Rich	2	3	1
Medium	23	39	31
Poor	1	3	6
loss aversion and age			
	<0,0001	**>0,0001 AND <00002**	**>0,0002**
0-25	3	3	2
25+50	3	18	9
50+	11	13	10
loss aversion and degree			
	<0,0001	**>0,0001 AND <00002**	**>0,0002**
Diploma	13	16	11
Bachelor	6	14	8
MSC	6	16	19

In tables 10 and 11 the risk was split in three ranges: the first one smaller than -2, the second one between -1 and - 2 and the last one higher than -1.

Table 10: RISK aversion - ambiguity aversion

Gender and risk aversion			
	<-2	**>-2 AND <-1**	**>-1**
Male	8	18	15
Female	21	22	25
WEALTH AND RISK AVERSION			
	<-2	**>-2 AND <-**	**>-1**
Rich	2	3	1
Medium	25	32	36
Poor	2	4	4
age and risk aversion			
	<-2	**>-2 AND <-**	**>-1**
0-25	2	3	3
25+50	8	11	11
50+	6	17	11
degree and risk aversion			
	<-2	**>-2 AND <-**	**>-1**
Diploma	10	15	15
Bachelor	7	12	9
MSC	12	12	17

Table 11: Risk aversion - IOC

Gender and risk aversion			
	<-2	**>-2 AND <-1**	**>-1**
Male	13	11	17
Female	17	27	24
WEALTH AND RISK AVERSION			
	<-2	**>-2 AND <-**	**>-1**
Rich	2	2	2
Medium	26	33	34
Poor	2	3	5
age and risk aversion			
	<-2	**>-2 AND <-**	**>-1**
0-25	3	2	3
25+50	3	13	14
50+	11	13	10
degree and risk aversion			
	<-2	**>-2 AND <-**	**>-1**
Diploma	12	13	15
Bachelor	8	11	9
MSC	9	15	17

4.2 First experiment – Illusion of Control

4.2.1 Qualitative analysis

The average investment per round of the first experiment is reported in Table 12.

Table 12: Mean invested sum

1st round	2nd round	3rd round	4th round
55.78 €	60.72 €	60.85 €	58.75 €

During the first round of the first experiment, participants were asked whether they preferred that the winning numbers were assigned to them or if they preferred to choose them. To this question, about 60% answered that they prefer to choose the winning numbers for themselves. However, when the same question is asked in the fourth round, but having to pay a penalty to be able to choose the winning numbers (equal to 5% of the available budget), only 35% of the participants wanted to choose the numbers (Tables 13 and 14).

In the second and third rounds, the participant could no longer choose, and the

Table 13: %IOC

%IOC
0.566371681

Table 14: %IOC with penalty

%IOC with penalty
0.353982301

numbers were respectively chosen and assigned. In these sections, it is of greater interest to note what was chosen by the participants in terms of investment level. The result is that only 32% preferred to invest more in the situation where it was possible to choose the numbers (Table 15).

Table 15: Investment Preference

%IOC	%Indifference	%Prefers numbers are chosen
0.3180	0.3008	0.3805

4.2.2 Quantitative analysis

As anticipated in the previous chapter, the level of risk aversion and the delta of the Choquet integral were calculated for the data to analyze what level of winning percentage was psychologically necessary for the subject to invest, thus evaluating how biases cognitively distort the winning probabilities. In Table 16 the descriptive statistcs of Choquet Delta is reported while in Table 17 the descriptive statistic for Risk Aversion is reported. The global values for each partecipant is reported in Appendix B.

Table 16: Descriptive statistics for Choquet Delta across the four experimental rounds.

Round	**Mean**	**Std Deviation**	**1st Quartile**	**2nd Quartile**	**3rd Quartile**	**Skewness**
1st round	0,180	0,148	0,005	0,186	0,336	0,183
2nd round	0,149	0,145	0,004	0,098	0,276	0,499
3rd round	0,149	0,147	0,002	0,098	0,276	0,520
4th round	0,160	0,150	0,005	0,168	0,300	0,382

Table 17: Descriptive statistics for Risk Aversion (CRRA) across the four experimental rounds.

Round	**Mean**	**Std Deviation**	**1st Quartile**	**2nd Quartile**	**3rd Quartile**	**Skewness**
1st round	-1,302	1,031	-2,080	-0,945	-0,478	-0,704
2nd round	-1,496	1,106	-2,138	-1,247	-0,677	-0,850
3rd round	-1,529	1,139	-2,329	-1,247	-0,677	-0,885
4th round	-1,431	1,040	-2,080	-1,002	-0,601	-0,470

The distribution of the values is right-oriented for Choquet delta and left oriented for risk aversion. Which means that the most of partecipants is heavily risk averse and has a pessimistic view. So the variables are inversly correlated. The distribution is not symetric as indicated by skewness. Overall the standard deviation is the same over round for both variables, meaning that even if partecipnats chnaged their behavoiur they change al in the same direction.

For Choquet Delta mean is higher than second quartile in second and third round, meaning that in this rounds the most of partecipants has winning subjective probability near to zero and only a few outliers change the mean. In first and fourth round mean is lower than second quartile, meaning that in this round the distribution is more symetric and optimistic behaviuor is higher among partecipants.

For Risk aversion parameter the mean is always lower than second quartile. Meaning that the most of partecipants is heavily risk seeking (negative value) and only a few outliers are risk averse. As visible from second quartile partecipants gets more risk seeking in the central rounds where they had less options (they can't choose wheter the numbers are selected by them or assigned to them).

4.3 Second experiment – Ambiguity aversion

4.3.1 Qualitative analysis

The average sum invested per round is reported in Table 18.

Table 18: Mean invested sum

1st Round	2nd Round	3rd Round	4th Round
56.21 €	58.58 €	59.42 €	60.96 €

In the first and forth sections of this experiment, participants were asked directly on which urn they preferred to invest (known composition or unknown composition). To the direct question asked in the first round, 70% of the participants declared that they preferred to invest in the urn with known composition (Table 9). In the fourth round, when a tax was imposed to make the choice of the urn with known composition, the percentage of participants who chose to invest in the urn with known composition dropped to 48% (Table 10).

Table 19: % Ambiguity aversion

% Ambiguity aversion
69.91%

Table 20: % Ambiguity aversion with penalty

% Ambiguity aversion with penalty
47.79%

During rounds 2 and 3, the participant had to invest respectively only in the urn with known composition and only in the urn with unknown composition. At a qualitative level, it is interesting to note in which of the two occasions they invested more. 41% of the participants preferred to invest more in the urn with known composition, 37% of the participants preferred to invest more in the urn with unknown composition, and 22% of the participants proved to be indifferent in terms of the sum invested between the two urnes (Table 11).

Table 21: Ambiguity Preferences

% Ambiguity aversion	% indifference	% Ambiguity propensity
40.71%	22.12%	37.17%

4.3.2 Quantitative analysis

As explained in the previous chapter, a quantitative analysis was also carried out on the data. For this type of analysis, as for the previous experiment, it was decided to apply the CRRA utility model + Choquet expected utility. In particular, the risk aversion of the participants was calculated. After calculating the risk aversion, it was possible to calculate the Choquet delta for each participant across each of the sections. In table 22 statistical description of Choquet Delta and in Table 23 statistical description of Risk Aversion is reported. Finally, the mean delta for each round was calculated . The global value for each partecipant of Choquet Delta and Rick aversion is reported in Appendix C.

Table 22: Descriptive statistics for Choquet Delta across the four experimental rounds.

Round	Mean	Std Deviation	1st Quartile	2nd Quartile	3rd Quartile	Skewness
1st round	0,167	0,144	0,030	0,168	0,292	0,421
2nd round	0,154	0,147	0,007	0,150	0,276	0,539
3rd round	0,154	0,155	0,004	0,115	0,292	0,547
4th round	0,145	0,143	0,005	0,106	0,259	0,605

Table 23: Descriptive statistics for Risk Aversion (CRRA) across the four experimental rounds.

Round	Mean	Std Deviation	1st Quartile	2nd Quartile	3rd Quartile	Skewness
1st round	-1,365	1,123	-1,648	-1,002	-0,627	-1,227
2nd round	-1,421	1,058	-2,025	-1,060	-0,677	-0,728
3rd round	-1,421	1,058	-2,025	-1,060	-0,677	-0,728
4th round	-1,492	1,076	-2,080	-1,214	-0,729	-0,762

As in the previous experiment the Delta has a right-oriented distribution and the Risk aversion has a left oriented distribution. Which means the most of partecipants are heavily risk averse and this lead the delta to fall to zero. It is interesting to note that every round the partecipants get more risk averse and more aggressive, meaning that probabibly they get used to the risk.

It is inetresting to note that the mean is the same for both Risk aversion and Choquet Delta for second and third round. This means that the behaviour in two dirrent cases (known compisition and known compisition) is mostly thea same across partecipants.

4.4 Third experiment – Myopic Loss Aversion

4.4.1 Qualitative analysis

In this section, two different investment plans were compared. Table 24 compares the average sums invested between the two investment plans.

Table 24: Mean sum invested

Plan A	Plan B				
Only round	1st round	2nd round	3rd round	4th round	Cumulative Plan B
226.58 €	56.35 €	53.16 €	55.96 €	57.54 €	223.01 €

To understand whether the bias was conditioned by loss aversion or by the myopic effect, we analyzed whether participants invested less after a loss compared to the previous round in investment Plan B, which consists of four rounds. The overall loss aversion of the experiment was calculated as the average of the loss aversions per round. The loss aversion of a single round was calculated by dividing the number of times participants invested less compared to the previous round following a loss by the total number of losses for that round. Table 25 summarizes the loss aversion values.

Table 25: Loss Aversion Overview

n of loss per round	90	84	65
n of games where invested decrease after a loss	39	23	27
% loss aversion	43.33%	27.38%	41.54%
% loss aversion in the experiment		37.42%	

4.4.2 Quantitative analysis

In this experiment, the reference model for the qualitative analysis was changed, and a Kahneman and Tversky model combined with Choquet expected utility was chosen. The numerical value of loss aversion was then calculated. The mean for Plan A and Plan B was subsequently obtained, and then thanks to the value of lambda (loss aversion coefficient), the Choquet delta (psychological winning probabilities) was calculated for each participant. Finally, the psychological winning probabilities were compared between Plan A and Plan B. Table 16 reports the lambda and delta results for each participant. Table 26 compares the mean lambda for Plan A and the mean lambda for Plan B. Table 27 compares the psychological probabilities of winning according to Choquet for Plan A and Plan B.

Table 26: Descriptive statistics for Loss Aversion (Lambda) under Plan A and Plan B.

Option	**Mean**	**Std Deviation**	**1st Quartile**	**2nd Quartile**	**3rd Quartile**	**Skewness**
Plan A	0,00249	0,02252	0,00010	0,00016	0,00025	10,57628
Plan B	0,00040	0,00145	0,00010	0,00015	0,00023	7,24610

Table 27: Corrected descriptive statistics for Subjective Winning Probability (Delta) under Plan A and Plan B.

Option	**Mean**	**Std Deviation**	**1st Quartile**	**2nd Quartile**	**3rd Quartile**	**Skewness**
Plan A	82,94%	0,15756	0,82025	0,87156	0,91382	-3,04237
Plan B	53,57%	0,16226	0,46170	0,56695	0,65056	-1,08863

For the loss aversion is possible to see that the most of partecipants are distribuited on the right meaning the most of them has a loss aversion that is very close to zero, this behaviour is even stronger in Plan A. The Delta is oriented to the left meaning that the most of partecipnats is heavely optimistic, more optimistic in Plan A than in Plan B.

Skewnnws shows that for loss aversion the distribution is heavily right-oriented, meaning that there a few individuals that are loss averse, but they are heavily loss averse so thet have a big impact on the mean. In plan A this phenomena is stronger. Meaning that for those few individuals loss averse, loss aversion was stronger in plan A (so the behaviour is the opposite of myopic loss aversion). For Choquet delta, the distirbution is left oriented, which means that most of individuals have higher subjective winning probability and only a few are pessimistic but their pessimism is high and lead the mean to lower values. Standard deviations is mostly the same meaning that there is not a big difference inside a single plan, but mean and quartile show that the behaviour is different: partecipnats are more optimistic in plan A than in Plan B.

5 Results

5.1 Myopic Loss Aversion

The third experiment focuses on the phenomenon of myopic loss aversion. For 57% of the participants, the cumulative amount invested in Plan B was lower than the amount chosen for investment in Plan A. On average across all participants, the total sum invested in Plan B was lower compared to Plan A (Table 14). However, looking at the core of the data, the difference between the averages is only 3.57 euros out of a 400-euro budget for each plan. This difference is quite small, amounting to approximately 1%. At a first glance, the data might suggest that the bias is present, albeit in a mild form, but the quantitative analysis reveals a completely different picture.

A primary finding is the percentage of times participants invested less after experiencing a loss: overall in Plan B, they invested less after a loss in only 37.42% of cases (Table 15). Nevertheless, comparing Tables 14 and 15, an aggregate pattern emerges: when more people lost in a given round, the average investment in the subsequent round was lower (for instance, in round 1, 90 out of 113 participants lost, and in round 2, the average investment dropped to just 53.16 euros); conversely, when fewer participants lost, the average investment was higher (in round 3, 65 participants lost, and in round 4, the average investment rose to 57.54 euros). Taken together, these two data points indicate that, at an individual level, a participant is tendentially more prone to keep their bet equal or increase it after a loss. At the same time, however, those who are psychologically sensitive to losses drastically decrease their investment—much more drastically than the amount increased by those who bet more.

To better understand the psychology of these participants, we must look at the data gathered through the advanced quantitative analysis. The quantitative results show that for both Plan B and Plan A, the loss aversion coefficients (λ) are extremely low. Essentially, the participants do not fear losses; instead, they attribute a much greater psychological weight to winnings (gain seeking). This behavior can be explained by the fact that participants did not have a real budget and therefore played exclusively for the sake of winning. A very interesting finding is that the lambda (λ) coefficient of loss aversion is higher in Plan A than in Plan B, indicating that under the effect of a single, one-shot round, the participant was much more worried about losing.

The analysis becomes even more interesting when considering another metric: the Choquet optimism/pessimism parameter (δ). In Plan A, individuals exhibit a much higher expectation of winning, which explains why they invested more on average despite the higher loss aversion. To summarize, in the one-shot round (Plan A), the participant was more worried about the loss yet more optimistic about their chances of victory. In this single round, the participant was psychologically more involved in the game and led to make more strategic investments based on their perceptions. In the sequential rounds (Plan B), individuals were less optimistic but also less subject to the weight of the loss; essentially, they were confident that, in the event of a loss, they could make up for it in the subsequent rounds. What may seem like a contradiction actually possesses a precise psychological meaning: where the loss carries a greater weight, the individual balances this by believing that the chances of winning are higher. Against the backdrop of a game without real investments and played for the pleasure of winning, the individual invests more and is more optimistic in the one-shot round, not as an effect of myopic loss aversion, but because they are psychologically more engaged in the single round where the budget is larger. At the same time, they do not suffer from myopic loss aversion in the repeated rounds over time; while a few individuals were frightened by losses and invested less, this conservative behavior is present only in a minority of subjects. The majority of individuals instead thought they could financially recover in the following rounds, a reaction directly driven by their low loss aversion.

5.2 Illusion of Control

The first experiment addresses the illusion of control. At a first qualitative glance regarding whether participants preferred to choose their own numbers or have them randomly assigned, 56% of the participants preferred to choose their own numbers. From an initial descriptive perspective, it would appear that the phenomenon is slightly present. However, to fully comprehend the psychology of the participants, it is useful to delve into a deeper analysis.

Regarding average investments, results show that participants invested more in the third round (where numbers were assigned to them) than in the second round (where they chose the numbers themselves). An interesting phenomenon emerges here: at a psychological level, individuals are slightly subject to the illusion of control, but the framework completely overturns in practice. When asked how much to invest, they feel almost relieved not to have to choose the numbers. Indeed, a solid 38% of individuals prefer to invest more when the numbers are chosen for them, and 30% are totally indifferent to this distinction. A fundamental piece of context helps in this analysis: the majority of the participants in the experiment are strongly risk-seeking. Since they are not playing with real money, they are inclined to invest and risk heavily. Furthermore, 65% of the participants believe that a 5-euro fee is too high a price to pay to choose their own numbers; ergo, they are highly attentive to their payoff but place little belief in their power over the events.

Although the illusion of control did not influence investment volumes when it came to choosing numbers or letting them be assigned, it is highly interesting to observe what happened to the perception of winning represented by the Choquet delta (δ): in round 2 and round 3, the perception of victory is virtually identical, meaning participants did not believe that choosing the numbers could alter their probability of winning. However, in round 1 and round 4—where the participant could choose not the numbers themselves, but rather *who* would choose the numbers—the Choquet delta (δ) is higher. Ergo, when the participant is presented with more choices regarding the structure of the game, the player believes they have a higher probability of winning. This demonstrates how subtle the illusion of control bias is, and how heavily it depends on the individual's perception of influence over the events.

Another highly interesting finding is the specific value obtained for the Choquet delta (δ). In fact, the higher the investment, the higher the risk aversion, and mathematically, the lower the perceived chances of victory. The chosen CRRA-Choquet model thus displays a very peculiar behavior in cases of strong risk propensity. In experiments like this one, where subjects play for the pleasure of winning rather than for real monetary gain, the strong propensity for risk squashes the perceived probability of winning. The player does not truly believe they can win, but bets heavily anyway because they have nothing to lose.

5.3 Ambiguity Aversion

In the second section, ambiguity aversion was analyzed. When directly asked whether they preferred the urn with a known composition or the urn with an unknown composition, 70% of the participants preferred the known urn. However, this percentage drops below half of the sample (approximately 48%) when they are asked to pay a fee.

As observed in the previous section, there is a sharp contrast in behavior when moving from the psychological perception of what is more convenient to the practical choice of how much to invest. At the moment of deciding the investment amounts, participants invest roughly the same sum in the lottery with the known urn as they do in the lottery with the unknown urn. Specifically, 40% of the participants invested more in the known urn, while 37% invested more in the unknown urn (with 22% being indifferent between the two). Therefore, those who invested in the urn psychologically perceived as riskier actually invested higher amounts.

Here too, the phenomenon of risk aversion helps to clarify this behavior. Coherently with the first experiment, almost all participants proved to be heavily risk-seeking. Just as in the previous experiment, the majority of individuals exhibit a Choquet delta (δ) that is lower than the objective probabilities of winning. The key to reading this framework is that individuals played for the sake of playing and not with the primary goal of taking home as much money as possible. The more unfavorable the situation appeared, the more they were inclined toward high stakes (which is highly visible in the fourth round, where the Choquet delta was at its lowest and the average sum invested was at its highest).

5.4 Demographic traits and bias presence

Based on frequencies calculated the χ^2 test was performed on the data. Following a table of the p-value obtained in the analysis.

Table 28: Chi-squared Test P-values Across Different Biases

Bias Type	Gender	Wealth	Age	Degree
Ambiguity aversion	0.11481	0.039194	0.225232	0.589451
Myopic loss aversion	0.597878	0.378268	0.949021	0.689006
Illusion of control	0.723672	0.724089	0.554538	0.215432

As shown by the p-values, no significant association was found within the sample between the individuals' demographic data and the presence of biases. The only variable that appears to have a statistically significant relationship is between the self-reported wealth level and the phenomenon of ambiguity aversion; specifically, in that case, poorer individuals proved to be more susceptible to the bias. The experiment was conducted with fake money ("Play Money effect"). As previous explained this phenomenoon has led to risky, aggressiva behaviour. Individuals haven't decided how much pay baised on their earnings, but purely based on the pleasure of the game. This has led to mitigate every socio-demographic difference between individuals. When we play a game we are all the same. The fact that for Ambiguity Aversion poorer individuals have been statistical more prone to the bias can be explained that for them risky and playful behaviour are less frequent.

The Chi-squared was led also for Δ, λ and γ. The values of P-value were analyzed as well. Also for Choquet Delta no statistical correlation was found with demographic caratheristics (Table 29, 30 and 31).

Table 29: Delta - ambiugity aversion

Gender	Wealth	Age	Degree
PVALUE	Pvalue	Pvalue	Pvalue
0,171648	0,092015	0,40623	0,423694

Table 30: delta - MLA

Gender	Wealth	Age	Degree
Pvalue	Pvalue	Pvalue	Pvalue
0,641035	0,692779	0,874911	0,40634

Table 31: DELTA - IOC

Gender	**Wealth**	**Age**	**Degree**
Pvalue	Pvalue	Pvalue	Pvalue
0,74742	0,39085	0,824675	0,741405

For loss aversion as well, no strong correlation was found with demographic traits (Table 32).

Table 32: LOSS AVERSION

Gender	**Wealth**	**Age**	**Degree**
Pvalue	Pvalue	Pvalue	Pvalue
0,557361	0,415040013	0,203497963	0,207362

For risk aversion no strong correlation was found between demographic traits and the coefficient of rsik aversion (Table 33 and 34)

Table 33: RISK aversion - ambiguity aversion

Gender	**Wealth**	**Age**	**Degree**
PVALUE	Pvalue	Pvalue	Pvalue
0,337423	0,835244011	0,836741	0,831847

Table 34: Risk aversion - IOC

Gender	**Wealth**	**Age**	**Degree**
Pvalue	Pvalue	Pvalue	Pvalue
0,388019	0,934061829	0,204723	0,885273

6 Conclusion

This work set out to verify whether three known cognitive biases to which investors are generally subject are present in extreme contexts. To do this, the answers to questionnaires on investment choices were analyzed.

The research revealed that under conditions of a lack of real incentives, in a heterogeneous sample of participants, the biases are not present. For illusion of control and ambiguity aversion, although psychologically the lottery where the presence of the bias was heavily disadvantaged turned out to be the preferred choice in most cases, when it came to wagering a sum in the investment, the participants' action was profoundly different from their perceived risk.

But the heart of the thesis and the most relevant results are present precisely in the quantitative analysis. From this, it emerged that the questionnaire participants revealed themselves to be strongly risk-seeking and gain-seeking. The participants did not experience the questionnaire as a real investment experience, but behaved as if they were participating in a game where they were guided by the thrill of winning, which led them to extreme and highly risky bets; their purpose was therefore not to secure as much money as possible, but to seek the win. In behavioral economics, this behavior has already been observed and is defined as the absence of "skin in the game," which leads to the gamification effect of the investment. This attitude can certainly be justified by the absence of real monetary incentives and by the difference between what is psychologically perceived as risky and the desire to accept that risk for the satisfaction of a big win. In the section on myopic loss aversion, upon an initial analysis of the results, the bias seemed to be present with an investment choice that favored the single and dry round of plan A compared to the four repeated rounds of plan B, but thanks to the quantitative analysis, it was possible to verify that the participants did not tend to bet less after a loss, believing they could make up for it with the next round. In reality, neither the myopic effect nor the loss aversion effect was present. In the section on illusion of control, most of the participants invested more in the lottery considered psychologically riskier; the bias was not present in the participants' action. Similar results were found in the section on ambiguity aversion: on average, the participants invested more or in an equal way in the lottery considered by themselves to be psychologically riskier.

The work carried out made it possible to identify that cognitive biases are indeed present in the subjects, but sometimes they do not modify the individuals' action in the way predicted by the literature. There is a difference between what is perceived as risky and the decision to want to take that risk for the desire of a higher win. Surely, it also emerged that there is a substantial difference between the psychology behind an investment with real winning opportunities and a commitment of one's own real money, and a game where nothing is won and nothing is lost. Another interesting outcome is given by the behaviors of the metrological models used in the quantitative analysis. The CRRA + Choquet integral model simplified to the win-or-loss case showed in this study a highly counterintuitive behavior in the case of strongly risk-seeking subjects. The more individuals are risk-seeking, the more they make high bets, and the lower, mathematically, the participant's subjective winning probabilities turn out to be. This counterintuitive result could be explained by the fact that such high bets do not correspond to real optimism, but rather that betting is guided solely by one's own pursuit of risk, even without being certain of winning. This behavior of the model could also be due to the fact that from a single piece of information, namely the sum invested, two different pieces of information were derived: risk aversion and the subjective winning probability, hence that the two balanced each other out, not reflecting the true winning probabilities perceived by the individual.

It would be interesting to replicate the experiment, giving some subjects a real budget with real earnings and not providing a budget to other subjects, to verify the true difference in behavior between a real investment and a game.

Equally interesting would be to deepen the understanding of the behavior of the CRRA+ Choquet model, by directly asking the participants how confident they are in their investment.

Another starting point is to study the gamification effect and how this can be applied to current online trading platforms, and how platforms that make investment resemble a game lead to different behaviors in investors.

7 Bibliography

Ahn, David, et al. "Estimating ambiguity aversion in a portfolio choice experiment." Quantitative Economics 5.2 (2014): 195-223

Aliyev, Nihad, and Xuezhong He. "Ambiguity and information tradeoffs." Available at SSRN 3254882 (2022)

Barber, Brad M., and Terrance Odean. "Boys will be boys: Gender, overconfidence, and common stock investment." The quarterly journal of economics 116.1 (2001): 261-292

Bellemare, Charles, et al. "Myopic loss aversion: Information feedback vs. investment flexibility." Economics Letters 87.3 (2005): 319-324

Benartzi, Shlomo, and Richard H. Thaler. "Myopic loss aversion and the equity premium puzzle." The quarterly journal of Economics 110.1 (1995): 73-92.

Bergen, V., et al. "Robust multivariate portfolio choice with stochastic covariance in the presence of ambiguity." Quantitative Finance 18.8 (2018): 1265-1294

Bhandari, Gokul, and Richard Deaves. "The demographics of overconfidence." The Journal of Behavioral Finance 7.1 (2006): 5-11.

Biais, Bruno, et al. "Judgemental overconfidence, self-monitoring, and trading performance in an experimental financial market." The Review of economic studies 72.2 (2005): 287-312

Bianchi, Milo, and Jean-Marc Tallon. "Ambiguity preferences and portfolio choices: Evidence from the field." Management Science 65.4 (2019): 1486-1501.

Borghans, Lex, et al. "Gender differences in risk aversion and ambiguity aversion." Journal of the European Economic Association 7.2-3 (2009): 649-658

Bühren, Christoph, Fabian Meier, and Marco Pleßner. "Ambiguity aversion: bibliometric analysis and literature review of the last 60 years." Management Review Quarterly 73.2 (2023): 495-525.

Davis, Deborah, Ian Sundahl, and Michael Lesbo. "Illusory personal control as a determinant of bet size and type in casino craps games 1." Journal of applied social psychology 30.6 (2000): 1224-1242.

DeBondt, W. F. M. and Thaler, R. H.: 1995, Financial decision-making in markets and firms: A behavioral perspective, in R. Jarrow, V. Maksimovic and W. T. Ziemba (eds), Finance: Handbooks in Operations Research and Management Science 9, North Holland, Amsterdam, pp. 385–410

Dominiak, Adam, Peter Duersch, and Jean-Philippe Lefort. "A dynamic Ellsberg urn experiment." Games and Economic Behavior 75.2 (2012): 625-638.

Durand, Robert B., Lucia Fung, and Manapon Limkriangkrai. "Myopic loss aversion, personality, and gender." Journal of Behavioral Finance 20.3 (2019): 339-353.

Ellsberg, Daniel. “Risk, Ambiguity, and the Savage Axioms.” The Quarterly Journal of Economics 75, no. 4, 1961: 643–669

Epstein, Larry G., and Martin Schneider. "Ambiguity, information quality, and asset pricing." The Journal of Finance 63.1 (2008): 197-228

Fellner, Gerlinde. "Illusion of control as a source of poor diversification: Experimental evidence." The Journal of Behavioral Finance 10.1 (2009): 55-67

Fellner, Gerlinde, Werner Güth, and Boris Maciejovsky. "Illusion of expertise in portfolio decisions: an experimental approach." Journal of Economic Behavior & Organization 55.3 (2004): 355-376

Fellner, Gerlinde, and Matthias Sutter. "Causes, consequences, and cures of myopic loss aversion–An experimental investigation." The Economic Journal 119.537 (2009): 900-916.

Fenton-O'Creevy, Mark, et al. "Trading on illusions: Unrealistic perceptions of control and trading performance." Journal of occupational and organizational psychology 76.1 (2003): 53-68

Fischhoff, Baruch, Paul Slovic, and Sarah Lichtenstein. "Knowing with certainty: The appropriateness of extreme confidence." Journal of Experimental Psychology: Human perception and performance 3.4 (1977): 552.

Friedl, Andreas, Patrick Ring, and Ulrich Schmidt. "Gender differences in ambiguity aversion under different outcome correlation structures." Theory and Decision 82.2 (2017): 211-219

Gao, Yongling, and Tarik Driouchi. "Accounting for ambiguity and trust in partial outsourcing: A behavioral real options perspective." Journal of Business Research 92 (2018): 93-104

Ghirardato, Paolo, Fabio Maccheroni, and Massimo Marinacci. "Differentiating ambiguity and ambiguity attitude." Journal of Economic Theory 118.2 (2004): 133-173

Gilboa, Itzhak, and David Schmeidler. "Maxmin expected utility with non-unique prior." Journal of mathematical economics 18.2 (1989): 141-153.

Glätzle-Rützler, Daniela, Matthias Sutter, and Achim Zeileis. "No myopic loss aversion in adolescents?–An experimental note." Journal of Economic Behavior & Organization 111 (2015): 169-176

Haigh, Michael S., and John A. List. "Do professional traders exhibit myopic loss aversion? An experimental analysis." The Journal of Finance 60.1 (2005): 523-534.

Halevy, Yoram. "Ellsberg revisited: An experimental study." Econometrica 75.2 (2007): 503-536

Heath, Chip, and Amos Tversky. "Preference and belief: Ambiguity and competence in choice under uncertainty." Journal of risk and uncertainty 4.1 (1991): 5-28.

Hopfensitz, Astrid, and Tanja Wranik. "Psychological and environmental determinants of myopic loss aversion." (2008).

Iturbe-Ormaetxe, Inigo, Giovanni Ponti, and Josefa Tomas. "Myopic loss aversion under ambiguity and gender effects." PloS one 11.12 (2016): e0161477

Kahneman, Daniel, and Amos Tversky. "Choices, values, and frames." American psychologist 39.4 (1984): 341

Kahneman, D., and A. Tversky, "Prospect Theory: An Analysis of Decision Under Risk," Econometrica 47, 1979, 263-291

Klibanoff, Peter; Marinacci, Massimo; Mukerji, Sujoy (2005). “A Smooth Model of Decision Making under Ambiguity.” Econometrica, 73(6): 1849–1892

Knight, Frank. "Risk, uncertainty and profit" Bonhopai Books, 2025

Koehler, Jonathan J., Brian J. Gibbs, and Robin M. Hogarth. "Shattering the illusion of control: Multi-shot versus single-shot gambles." Journal of Behavioral Decision Making 7.3 (1994): 183-191.

Kyle, Albert S., and F. Albert Wang. "Speculation duopoly with agreement to disagree: Can overconfidence survive the market test?." The Journal of Finance 52.5 (1997): 2073-2090

Langer, Ellen J. "The illusion of control." Journal of personality and social psychology 32.2 (1975): 311

Larson, Francis, John A. List, and Robert D. Metcalfe. Can myopic loss aversion explain the equity premium puzzle? Evidence from a natural field experiment with professional traders. No. w22605. National Bureau of Economic Research, 2016.

Li, Chen. "Are the poor worse at dealing with ambiguity?." Journal of Risk and Uncertainty 54.3 (2017): 239-268.

Looney, Clayton Arlen, and Andrew M. Hardin. "Decision support for retirement portfolio management: Overcoming myopic loss aversion via technology design." Management Science 55.10 (2009): 1688-1703

Maccheroni, Fabio, Massimo Marinacci, and Aldo Rustichini. "Ambiguity aversion, robustness, and the variational representation of preferences." Econometrica 74.6 (2006): 1447-1498

Mehra, Rajnish, and Edward C. Prescott. "The equity premium: A puzzle." Journal of monetary Economics 15.2 (1985): 145-161.

Presson, Paul K., and Victor A. Benassi. "Illusion of control: A meta-analytic review." Journal of social behavior and personality 11.3 (1996): 493

Sarin, Rakesh K., and Martin Weber. "Effects of ambiguity in market experiments." Management science 39.5 (1993): 602-615

Satinover, J. B., and Didier Sornette. "Illusory versus genuine control in agent-based games." The European Physical Journal B 67.3 (2009): 357-367

Schmeidler, David. "Subjective probability and expected utility without additivity." Econometrica: Journal of the Econometric Society (1989): 571-587

Sutter, Matthias. "Are teams prone to myopic loss aversion? An experimental study on individual versus team investment behavior." Economics Letters 97.2 (2007): 128-132

Trautmann, Stefan T., Ferdinand M. Vieider, and Peter P. Wakker. "Causes of ambiguity aversion: Known versus unknown preferences." Journal of Risk and Uncertainty 36.3 (2008): 225-243.

Tversky, Amos, and Craig R. Fox. "Weighing risk and uncertainty." Psychological review 102.2 (1995): 269

Weinstein, Neil D. "Unrealistic optimism about future life events." Journal of personality and social psychology 39.5 (1980): 806.

Wesslen, Ryan, et al. "Effect of uncertainty visualizations on myopic loss aversion and the equity premium puzzle in retirement investment decisions." IEEE Transactions on Visualization and Computer Graphics 28.1 (2021): 454-464.

Yarritu, Ion, Helena Matute, and Miguel A. Vadillo. "Illusion of control." Experimental psychology (2014)

8 Appendix B

Table 35: Quantitative Analysis - Illusion of Control

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
0.039	0.422	0.039	0.422	0.039	0.422	0.039	0.422
-0.94	0.187	-1.25	0.098	-1.65	0.030	-1.61	0.034
-3	0	-3	0	-3	0	-3	0
-2.08	0.005	-3	0	-1.28	0.090	-3	0
0.273	0.419	0.250	0.420	0.202	0.423	0.085	0.424
-0.31	0.377	-0.31	0.377	-0.31	0.377	-0.31	0.377
-0.31	0.377	-0.31	0.377	-0.31	0.377	-0.33	0.372
-0.94	0.187	-1.09	0.141	-3	0	-1	0.168
-0.94	0.187	-0.94	0.187	-0.94	0.187	-0.94	0.187
-0.94	0.187	-1.69	0.026	-1.38	0.069	-2.08	0.005
-0.31	0.377	-2.20	0.003	-0.31	0.377	-0.31	0.377
-0.68	0.276	-0.68	0.276	-0.68	0.276	-0.68	0.276
-1.42	0.062	-1.25	0.098	-0.94	0.187	-1.61	0.034
-0.63	0.293	-0.24	0.391	-2.64	0.0003	-1	0.168
-3	0	-3	0	-0.94	0.187	-0.94	0.187
-3	0	-3	0	-3	0	-3	0
-0.31	0.377	-0.55	0.316	-0.43	0.349	-3	0
-0.19	0.399	-0.68	0.276	-0.17	0.402	0.039	0.422
-1.73	0.022	-3	0	-0.68	0.276	-1	0.168
-1.31	0.083	-1.35	0.076	-1	0.168	-1.28	0.090
-0.94	0.187	-1.25	0.098	-1.45	0.056	-0.94	0.187
-1.03	0.159	-1.25	0.098	-0.92	0.196	-0.41	0.356
-0.94	0.187	-1.25	0.098	-1.61	0.034	-0.94	0.187
0.039	0.422	0.039	0.422	0.039	0.422	-0.19	0.399
-3	0	-0.94	0.187	-3	0	-1.82	0.016
-0.43	0.349	-0.43	0.349	-0.43	0.349	-0.94	0.187
-1.12	0.132	-1.31	0.083	-1.18	0.115	-1.25	0.098
-0.43	0.349	-0.68	0.276	-0.68	0.276	-0.43	0.349

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Table 35 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-1.12	0.132	-1.03	0.159	-1.31	0.083	-1.06	0.150
-3	0	-0.94	0.187	-0.94	0.187	-1.25	0.098
-2.64	0.0003	-3.07	2.49×10^{-5}	-2.84	0.0001	-3.07	2.5×10^{-5}
-0.94	0.187	-0.94	0.187	-0.97	0.177	-0.94	0.187
-1.06	0.15	-1.12	0.132	-5.19	3.4×10^{-13}	-3	0.018
-0.43	0.349	-0.65	0.285	-0.68	0.276	-0.7	0.268
-1.15	0.123	-0.60	0.300	-0.78	0.242	-1.21	0.106
-0.19	0.399	-0.19	0.399	-0.19	0.399	-0.19	0.399
-0.97	0.177	-1.42	0.062	-0.97	0.177	-0.97	0.177
-3	0	-2.14	0.004	-1.53	0.044	-1.69	0.026
-0.43	0.349	-0.43	0.349	-0.43	0.349	-0.43	0.349
-0.63	0.293	-0.55	0.316	-1.03	0.159	-0.6	0.300
-0.94	0.187	-5.19	3.38×10^{-13}	-3	0	-3	0
-3	0	-3	0	-3	0	-3	0
-3	0	-0.94	0.187	-3	0	-3	0
-2.14	0.004	-2.20	0.003	-1.31	0.083	-2.08	0.005
-3	0	-3	0	-3	0	-3	0
-0.94	0.187	-1.25	0.098	-0.68	0.276	-0.94	0.187
-1.69	0.026	-1.78	0.019	-2.14	0.004	-1.69	0.026
-0.94	0.187	-3	0	-3	0	-1.61	0.034
-0.94	0.187	-2.14	0.004	-2.74	0.0002	-1.87	0.013
-3	0	-3	0	-3	0	-3	0
-3.07	2×10^{-5}	-1.97	0.009	-1.53	0.044	-1.45	0.056
-0.97	0.177	-1.25	0.098	-1.53	0.044	-0.86	0.214
-1.09	0.141	-2.08	0.005	-1.25	0.098	-1.25	0.098
-0.08	0.414	-0.31	0.377	-0.55	0.316	-0.55	0.316
-0.31	0.377	-0.50	0.330	-0.94	0.187	-0.5	0.330
-3	0	-3	0	-4.49	3.6×10^{-10}	-3	0
-1.35	0.076	-1.73	0.022	-2.26	0.002	-1	0.168
-0.97	0.177	-1.53	0.044	-1.42	0.062	-1.73	0.022
-0.43	0.349	-0.24	0.391	-0.55	0.316	-0.12	0.409

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Table 35 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-1.09	0.141	-1.42	0.062	-2.26	0.002	-3	0
-1.25	0.098	-1.25	0.098	-1.28	0.090	-1.35	0.076
-3	0	-3	0	-3	0	-3	0
-3	0	-2.08	0.005	-3	0	-2.08	0.005
-0.94	0.187	-2.08	0.005	-2.08	0.005	-2.08	0.005
-0.83	0.224	-0.81	0.233	-0.58	0.308	-1.06	0.150
-2.08	0.005	-2.08	0.005	-0.94	0.187	-0.68	0.276
-0.94	0.187	-3	0	-1.25	0.098	-0.68	0.276
0.273	0.419	0.273	0.419	-2.84	0.0001	-3	0
-0.45	0.343	-0.55	0.316	-0.81	0.233	-0.89	0.205
-3	0	-3	0	-5.19	3.4×10^{-13}	-3	0
-0.68	0.276	-0.94	0.187	-1.09	0.141	-0.94	0.187
-3	0	-3	0	-0.94	0.187	-1	0.168
-1.61	0.034	-0.94	0.187	-1.82	0.016	-1.18	0.115
-0.58	0.308	-0.58	0.308	-1.38	0.069	-0.68	0.276
-3	0	-3	0	-3	0	-3	0
-3	0	-3	0	-1.09	0.141	-0.94	0.187
-0.94	0.187	-0.92	0.196	-1.61	0.034	-0.94	0.187
-1.35	0.076	-0.86	0.214	-1.06	0.150	-1	0.168
-2.08	0.005	-2.08	0.005	-2.08	0.005	-2.08	0.005
-0.53	0.323	-2.02	0.007	-0.17	0.402	-0.43	0.349
-3	0	-3	0	-3	0	0.273	0.419
-1.61	0.034	-1.61	0.034	-1.61	0.034	-1.61	0.034
0.062	0.423	-0.50	0.330	-0.36	0.367	-0.58	0.308
-1.25	0.098	-1.25	0.098	-1.25	0.098	-2.08	0.005
-0.31	0.377	-0.31	0.377	-0.31	0.377	-0.31	0.377
-0.68	0.276	-3	0	-3	0	-3	0
-0.22	0.395	-1.06	0.150	-3.37	3.3×10^{-6}	-1.57	0.039
-3	0	-3	0	-3	0	-3	0
-0.43	0.349	-0.33	0.372	-0.45	0.343	-0.48	0.337
-0.31	0.377	-0.31	0.377	-0.31	0.377	-0.31	0.377

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Table 35 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-0.63	0.293	-0.63	0.293	-0.36	0.367	-0.63	0.293
-0.92	0.196	-0.92	0.196	-1.12	0.132	-0.86	0.214
-0.97	0.177	-0.94	0.187	-0.94	0.187	-0.22	0.395
-0.45	0.343	-0.83	0.224	-0.94	0.187	-0.26	0.387
-1.61	0.034	-1.65	0.030	-3.07	2.5×10^{-5}	-3.56	8.5×10^{-7}
-0.94	0.187	-0.94	0.187	-0.43	0.349	-0.55	0.316
-0.70	0.268	-0.75	0.251	-0.19	0.399	-0.22	0.395
-1.21	0.106	-1.42	0.062	-2.33	0.002	-2.33	0.002
0.273	0.419	0.273	0.419	0.179	0.423	0.155	0.424
-3.56	9×10^{-7}	-3	0	-2.20	0.003	-3	0
-0.17	0.402	-0.31	0.377	-0.45	0.343	-0.70	0.268
-0.94	0.187	-0.94	0.187	-0.94	0.187	-0.94	0.187
-0.48	0.337	-0.68	0.276	-0.55	0.316	-0.55	0.316
-0.48	0.337	-3	0	-1.61	0.034	-3	0.003
-0.97	0.177	-0.94	0.187	-0.94	0.187	-3	0
-0.53	0.323	-0.58	0.308	-0.53	0.323	-0.33	0.372
-0.94	0.187	-1.25	0.098	-2.08	0.005	-2.08	0.005
-3	0	-3	0	-3	0	-3	0
-3	0	-3	0	-3	0	-3	0
-3	0	-5.19	3.38×10^{-13}	-3	0	-3	0
-1	0.168	-1.06	0.150	-1.03	0.159	-1.09	0.141
-1.53	0.044	-1.65	0.030	-1.69	0.026	-2.74	0.0002
-0.43	0.349	-0.43	0.349	-0.43	0.349	-0.43	0.349

9 Appendix C

Table 36: Quantitative analysis - Ambiguity aversion

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
0,04	0,42	0,04	0,42	0,04	0,42	0,04	0,42
-1,21	0,11	-1,61	0,03	-1,53	0,04	-1,65	0,03
-3,00	0,00	-3,00	0,00	-0,94	0,19	-3,00	0,00
-1,65	0,03	-4,49	0,00	-3,00	0,00	-3,00	0,00
0,25	0,42	0,27	0,42	0,27	0,42	0,18	0,42
-0,94	0,19	-1,82	0,02	-3,00	0,00	-3,00	0,00
-0,31	0,38	-3,00	0,00	-3,00	0,00	-0,94	0,19
-0,94	0,19	-0,94	0,19	-0,43	0,35	-0,43	0,35
0,27	0,42	-0,94	0,19	-2,08	0,01	-0,94	0,19
-1,31	0,08	-1,82	0,02	-1,78	0,02	-1,65	0,03
-0,31	0,38	-0,31	0,38	-0,31	0,38	-0,31	0,38
-0,68	0,28	-0,68	0,28	-0,19	0,40	-0,68	0,28
-1,53	0,04	-2,08	0,01	-1,61	0,03	-1,61	0,03
-0,45	0,34	-1,82	0,02	-1,42	0,06	-2,20	0,00
-0,94	0,19	-0,94	0,19	-3,00	0,00	-0,94	0,19
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-0,31	0,38	-0,55	0,31	-1,09	0,14	-1,28	0,09
0,13	0,42	-0,31	0,38	-0,19	0,40	-0,68	0,28
-1,12	0,13	0,09	0,42	0,18	0,42	-1,38	0,07
-1,38	0,07	-0,94	0,19	-0,97	0,18	-0,92	0,20
-1,00	0,17	-1,31	0,08	-0,68	0,28	-1,31	0,08
-3,56	0,00	-2,74	0,00	-1,92	0,01	-1,87	0,01
-0,94	0,19	-0,70	0,27	-1,61	0,03	-0,97	0,18
-0,19	0,40	-0,19	0,40	-0,31	0,38	-0,08	0,41
-3,00	0,00	-0,94	0,19	0,27	0,42	-0,31	0,38
-1,61	0,03	-2,08	0,01	-0,50	0,33	-1,82	0,02
-1,35	0,08	-1,31	0,08	-1,82	0,02	-1,92	0,01
-0,94	0,19	-0,94	0,19	-1,25	0,10	-1,61	0,03

Continues next page

Table 36 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-0,03	0,42	-0,10	0,41	-0,05	0,42	-0,08	0,41
-0,94	0,19	-2,08	0,01	-3,00	0,00	-3,00	0,00
-2,40	0,00	-2,74	0,00	-3,00	0,00	-3,07	0,00
-1,00	0,17	-1,06	0,15	-0,92	0,20	-0,94	0,19
-2,26	0,00	-1,35	0,08	-1,38	0,07	-1,21	0,11
-0,94	0,19	-0,65	0,28	-0,41	0,35	-0,92	0,20
-1,03	0,16	-1,06	0,15	-0,70	0,27	-1,00	0,17
-0,31	0,38	-0,94	0,19	-1,82	0,02	-3,00	0,00
-1,21	0,11	-1,42	0,06	-1,42	0,06	-1,42	0,06
-1,69	0,03	-1,78	0,02	-1,57	0,04	-1,65	0,03
0,25	0,42	0,20	0,42	0,23	0,42	0,25	0,42
-0,31	0,38	-0,26	0,39	-0,89	0,20	-0,83	0,22
-0,94	0,19	-0,94	0,19	-0,94	0,19	-0,94	0,19
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-0,97	0,18	-1,00	0,17	-2,14	0,00	-1,65	0,03
-4,49	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-1,25	0,10	-1,21	0,11	-1,61	0,03	-2,08	0,01
-2,56	0,00	-2,56	0,00	-2,84	0,00	-2,02	0,01
-0,94	0,19	-0,89	0,20	-3,00	0,00	-3,00	0,00
-0,75	0,25	-0,94	0,19	-0,75	0,25	-1,28	0,09
-4,49	0,00	-3,00	0,00	-5,19	0,00	-5,19	0,00
-1,61	0,03	-1,73	0,02	-1,61	0,03	-1,45	0,06
-0,97	0,18	-2,74	0,00	-0,97	0,18	-1,57	0,04
-1,61	0,03	-1,61	0,03	-2,84	0,00	-3,00	0,00
-0,53	0,32	-0,31	0,38	-1,06	0,15	-1,03	0,16
-0,55	0,31	-0,94	0,19	-0,70	0,27	-0,73	0,26
-4,08	0,00	-3,00	0,00	-4,08	0,00	-3,00	0,00
-0,65	0,28	-1,69	0,03	-2,02	0,01	-1,31	0,08
-1,31	0,08	-1,82	0,02	-0,94	0,19	-0,92	0,20
-0,58	0,31	-0,94	0,19	-0,55	0,31	-0,38	0,36

Continues next page

Table 36 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-2,08	0,01	-2,56	0,00	-3,00	0,00	-0,50	0,33
-1,25	0,10	-1,28	0,09	-1,21	0,11	-1,31	0,08
-3,00	0,00	-3,00	0,00	-3,00	0,00	-4,49	0,00
-0,94	0,19	-0,94	0,19	-1,25	0,10	-0,94	0,19
-0,94	0,19	-0,97	0,18	-0,94	0,19	-0,94	0,19
-0,78	0,24	-0,78	0,24	-1,12	0,13	-0,73	0,26
-1,61	0,03	-1,25	0,10	-0,94	0,19	-0,94	0,19
-0,94	0,19	-3,00	0,00	-1,25	0,10	-3,00	0,00
-5,19	0,00	0,27	0,42	0,27	0,42	0,27	0,42
-0,97	0,18	-2,02	0,01	-3,00	0,00	-1,87	0,01
-1,09	0,14	-1,69	0,03	-2,08	0,01	-1,15	0,12
-0,94	0,19	-0,94	0,19	-0,94	0,19	-0,94	0,19
-1,03	0,16	-1,03	0,16	-1,06	0,15	-1,25	0,10
-0,94	0,19	-0,92	0,20	-0,94	0,19	-1,42	0,06
-0,43	0,35	-0,92	0,20	-1,00	0,17	-0,55	0,32
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-3,00	0,00	-1,00	0,17	-0,97	0,18	-0,97	0,18
-1,61	0,03	-1,25	0,10	-1,12	0,13	-1,09	0,14
-1,28	0,09	-0,68	0,28	-1,18	0,11	-0,94	0,19
-2,08	0,01	-2,08	0,01	-2,08	0,01	-2,08	0,01
-0,12	0,41	-0,01	0,42	-0,12	0,41	0,13	0,42
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-0,94	0,19	-0,94	0,19	-0,94	0,19	-0,94	0,19
0,02	0,42	-0,12	0,41	-0,15	0,41	-0,31	0,38
-1,25	0,10	-1,61	0,03	-1,61	0,03	-1,61	0,03
-0,31	0,38	-0,31	0,38	-0,19	0,40	-0,19	0,40
-0,68	0,28	-0,89	0,20	-3,00	0,00	-3,00	0,00
-1,61	0,03	-1,65	0,03	-0,81	0,23	-1,09	0,14
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-0,43	0,35	-0,48	0,34	-0,10	0,41	-0,38	0,36
-0,31	0,38	-0,31	0,38	-0,31	0,38	-0,31	0,38

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Table 36 – Continues from previous page

Risk aversion 1st round	Delta 1st round	Risk aversion 2nd round	Delta 2nd round	Risk aversion 3rd round	Delta 3rd round	Risk aversion 4th round	Delta 4th round
-0,63	0,29	-0,63	0,29	-0,63	0,29	-0,63	0,29
-1,21	0,11	-4,49	0,00	-3,00	0,00	-0,97	0,18
-1,25	0,10	-1,25	0,10	-0,58	0,31	-0,70	0,27
-0,53	0,32	-0,45	0,34	-1,53	0,04	-3,00	0,00
-1,65	0,03	-2,02	0,01	-1,73	0,02	-1,97	0,01
-0,94	0,19	-0,55	0,31	-0,31	0,38	-0,55	0,32
-0,24	0,39	-0,17	0,40	-0,10	0,41	-0,55	0,32
-2,08	0,01	-2,95	0,00	-2,02	0,01	-2,26	0,00
0,02	0,42	0,13	0,42	-0,10	0,41	-0,17	0,40
-4,49	0,00	-1,06	0,15	-5,19	0,00	-3,00	0,00
-0,92	0,20	-0,68	0,28	-0,68	0,28	-0,68	0,28
-0,94	0,19	-0,94	0,19	-0,31	0,38	-1,09	0,14
-0,55	0,31	-0,55	0,31	-0,19	0,40	-0,43	0,35
-1,65	0,03	-1,97	0,01	-2,33	0,00	-3,00	0,00
-0,94	0,19	-0,92	0,20	-1,06	0,15	-1,15	0,12
-0,58	0,31	-0,05	0,42	-0,58	0,31	-0,58	0,31
-1,61	0,03	-1,61	0,03	-1,42	0,06	-1,25	0,10
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-1,25	0,10	-1,53	0,04	-3,00	0,00	-3,00	0,00
-3,00	0,00	-3,00	0,00	-3,00	0,00	-3,00	0,00
-1,35	0,08	-1,28	0,09	-1,12	0,13	-1,15	0,12
-3,07	0,00	-4,08	0,00	-1,61	0,03	-1,73	0,02
-0,43	0,35	-0,43	0,35	-0,43	0,35	-0,43	0,35

10 Appendix D

Table 37: Analysis of Plan A and Plan B

Plan A		Plan B	
LAMBDA	**DELTA**	**LAMBDA**	**DELTA**
0,0015	0,4423	0,0015	0,1144
0,0003	0,7883	0,0001	0,5995
0,0001	0,8803	0,0001	0,6099
0,0001	0,9097	0,0001	0,7230
0,0005	0,7162	0,0004	0,3149
0,0001	0,9138	0,0001	0,7096
0,0001	0,9358	0,0002	0,5368
0,0003	0,8040	0,0003	0,4242
0,0001	0,8955	0,0002	0,5531
0,0001	0,8820	0,0002	0,5609
0,0002	0,8251	0,0004	0,3119
0,0015	0,4423	0,0001	0,5684
0,0001	0,8803	0,0001	0,6495
0,0002	0,8404	0,0002	0,4880
0,0002	0,8674	0,0002	0,4721
0,0003	0,8010	0,0001	0,5941
0,0009	0,5780	0,0004	0,3404
0,2394	0,0051	0,0102	0,0191
0,0001	0,9135	0,0001	0,6537
0,0001	0,8837	0,0002	0,5624
0,0002	0,8742	0,0002	0,5334
0,0001	0,9147	0,0001	0,6669
0,0002	0,8203	0,0002	0,5368
0,0007	0,6274	0,0006	0,2443
0,0002	0,8203	0,0002	0,4617
0,0002	0,8203	0,0003	0,4172
0,0001	0,8955	0,0001	0,5995
0,0004	0,7297	0,0002	0,4617
0,0005	0,6855	0,0007	0,2214
0,0002	0,8688	0,0001	0,6558
0,0001	0,9340	0,0001	0,7081

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Table 37 – Continues from previous page

Plan A		Plan B	
LAMBDA	**DELTA**	**LAMBDA**	**DELTA**
0,0002	0,8695	0,0002	0,5515
0,0001	0,9094	0,0001	0,6174
0,0002	0,8653	0,0001	0,6099
0,0003	0,8177	0,0003	0,4077
0,0004	0,7297	0,0002	0,5368
0,0002	0,8203	0,0001	0,5699
0,0001	0,8928	0,0001	0,6430
0,0139	0,0812	0,0118	0,0166
0,0003	0,8069	0,0002	0,5196
0,0001	0,9358	0,0001	0,6558
0,0001	0,9358	0,0001	0,7444
0,0001	0,9353	0,0001	0,7438
0,0002	0,8716	0,0001	0,6149
0,0001	0,9358	0,0001	0,7444
0,0002	0,8331	0,0001	0,5758
0,0002	0,8499	0,0003	0,4077
0,0004	0,7491	0,0001	0,6579
0,0001	0,8863	0,0001	0,5872
0,0002	0,8716	0,0001	0,7444
0,0001	0,8986	0,0002	0,5624
0,0001	0,9041	0,0001	0,6463
0,0002	0,8674	0,0001	0,6659
0,0001	0,8853	0,0001	0,5654
0,0003	0,7883	0,0002	0,4781
0,0001	0,9224	0,0001	0,7142
0,0002	0,8615	0,0001	0,6186
0,0002	0,8674	0,0002	0,5562
0,0002	0,8404	0,0002	0,4638
0,0001	0,9358	0,0011	0,1533
0,0001	0,8946	0,0001	0,6124
0,0002	0,8674	0,0001	0,7438
0,0001	0,9358	0,0001	0,5968
0,0001	0,8858	0,0001	0,6086
0,0002	0,8444	0,0002	0,5593

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Table 37 – Continues from previous page

Plan A		Plan B	
LAMBDA	**DELTA**	**LAMBDA**	**DELTA**
0,0002	0,8674	0,0001	0,5684
0,0001	0,9141	0,0001	0,6397
0,0001	0,9351	0,0001	0,6659
0,0001	0,9358	0,0002	0,5178
0,0001	0,9030	0,0001	0,7374
0,0002	0,8681	0,0002	0,5351
0,0001	0,9138	0,0001	0,7135
0,0001	0,9091	0,0002	0,5368
0,0001	0,9358	0,0003	0,4053
0,0001	0,9358	0,0001	0,7444
0,0002	0,8702	0,0002	0,5115
0,0002	0,8600	0,0001	0,5669
0,0001	0,8831	0,0001	0,5729
0,0001	0,9138	0,0001	0,6846
0,0011	0,5241	0,0003	0,3648
0,0001	0,9358	0,0001	0,7444
0,0002	0,8688	0,0002	0,5418
0,0001	0,9217	0,0004	0,3376
0,0001	0,8951	0,0001	0,6034
0,0004	0,7245	0,0005	0,2759
0,0001	0,9358	0,0001	0,7049
0,0001	0,9010	0,0002	0,4741
0,0001	0,9265	0,0001	0,7380
0,0013	0,4743	0,0006	0,2345
0,0004	0,7297	0,0004	0,3119
0,0002	0,8298	0,0002	0,4445
0,0001	0,8820	0,0001	0,5844
0,0001	0,9091	0,0001	0,5955
0,0001	0,9358	0,0004	0,3348
0,0001	0,9346	0,0001	0,6317
0,0002	0,8203	0,0007	0,2280
0,0002	0,8653	0,0002	0,5033
0,0001	0,9176	0,0001	0,7073
0,0016	0,4253	0,0008	0,2047

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Table 37 – Continues from previous page

Plan A		Plan B	
LAMBDA	**DELTA**	**LAMBDA**	**DELTA**
0,0001	0,9210	0,0001	0,6917
0,0002	0,8576	0,0002	0,5051
0,0002	0,8681	0,0002	0,5368
0,0006	0,6486	0,0006	0,2507
0,0001	0,9197	0,0001	0,6506
0,0002	0,8688	0,0002	0,4511
0,0018	0,4075	0,0003	0,4172
0,0002	0,8674	0,0001	0,6099
0,0001	0,9358	0,0001	0,6659
0,0001	0,9358	0,0002	0,5499
0,0001	0,9358	0,0001	0,7444
0,0001	0,9073	0,0001	0,6073
0,0001	0,9217	0,0001	0,6698
0,0004	0,7297	0,0003	0,3674

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Appendix A

Blocco 31

Benvenuto!
Ti vengono forniti 1200 euro da investire. Gli investimenti avverranno in 3 esperimenti.
Il primo esperimento ha quattro round.
Il secondo esperimento ha quattro round
Il terzo esperimento è formato da due piani di investimento: il piano A con un singolo round e il piano B con quattro round.
Al termine dei tuoi investimenti potrai scoprire il rendimento del portafoglio da te costruito.

Domande generali

Quanti anni hai?

0 10 20 30 40 50 60 70 80 90 100

Fai clic per scrivere la scelta 1

Qual è il tuo genere?

- Maschio
- Femmina
- Preferisco non rispondere

Ti definiresti più ricco o più povero

- Ricco
- Nè ricco nè povero
- Povero

Qual è il tuo titolo di studio?

- diploma
- Laurea Triennale
- Laurea magistrale

Primo esperimento

L'investimento avviene in quattro round in ognuno dei quali potrai investire fino a 100 euro. L'esito dell'investimento dipende dal lancio di un dado che viene immediatamente osservato. Ti saranno assegnati o potrai scegliere tre numeri. In caso dal lancio del dado esca uno dei tre numeri il rendimento sarà pari a 2,5 volte il capitale investito, altrimenti il capitale investito andrà interamente perduto. Il capitale non investito avrà un rendimento del 5%.

Primo Round

Primo Round

In questo round puoi scegliere se selezionare tu i numeri vincenti oppure lasciare che ti vengano assegnati

Quanto vuoi investire? Inserire un importo tra 0 e 100

0 10 20 30 40 50 60 70 80 90 100

Fai clic per scrivere la scelta 1

Voglio scegliere i numeri/Voglio che vengano scelti per me

- Voglio sceglierli
- Voglio che vengano scelti

I miei numeri vincenti sono

- 1
- 2
- 3
- 4
- 5
- 6

Risultato Primo Round

La somma investita è : ${e://Field/Somma_investita_R1}

La somma non investita
è ${e://Field/Somma_non_investita_R1}

Il numero estratto è ${e://Field/Risultato_dado_R1}

La somma Vinta è ${e://Field/Risultato1}

Secondo Round

Secondo Round

In questo round dovrai scegliere tu i numeri vincenti

Quanto vuoi investire? Inserire un importo tra 0 e 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

I miei numeri vincenti sono

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6

Risultato Secondo Round

La somma investita è : ${e://Field/Somma_investita_R2}

La somma non investita è ${e://Field/Somma_non_investita_R2}

Il numero estratto è ${e://Field/Risultato_dado_R2}

La somma Vinta è: ${e://Field/Guadagno2}

Terzo Round

Terzo Round

In questo round ti verranno assegnati i numeri vincenti

Quanto vuoi investire? Inserire un importo tra 0 e 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

Risultato terzo round

La somma investita è :
${e://Field/Somma_investita_R3}

La somma non investita
è ${e://Field/Somma_non_investita_R3}

Il numero estratto è ${e://Field/Risultato_dado_R3}

La somma Vinta è: ${e://Field/Risultato3}

Quarto Round

Quarto Round

In questo round puoi scegliere se selezionare i numeri vincenti oppure lasciare che ti vengano assegnati, ma per sceglierli devi pagare una tassa di 5 euro

Quanto vuoi investire? Inserire un importo tra 0 e 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

Voglio scegliere i numeri/Voglio che vengano scelti per me

- Voglio sceglierli
- Voglio che vengano scelti

I miei numeri vincenti sono

- 1
- 2
- 3
- 4
- 5

☐ 6

Risultato quarto round

La somma investita è
:${e://Field/Somma_investita_R4}

La somma non investita
è ${e://Field/Somma_non_investita_R4}

Il numero estratto è ${e://Field/Risultato_dado_R4}

La somma Vinta è: ${e://Field/Payoff4}

Secondo esperimento

L'investimento avviene in quattro round in ognuno dei quali potrai investire fino a 100 euro. L'esito dell'investimento dipende dall’estrazione di una biglia da un urna. Sono presenti due urne: Urna A contiene 50 biglie rosse e 50 biglie nere Urna B contiene 100 biglie rosse o nere in composizione ignota Dovrai scegliere preventivamente il colore di vincita. In venga estratto quel colore il rendimento sarà di 2,5 volte il capitale investito, altrimenti il capitale investito è interamente perduto. Il capitale non investito avrà un rendimento del 5%.

Primo Round

Primo Round

In questo round potrai scegliere da quale urna estrarre la tua biglia

Quanto vuoi investire? Inserire un importo da 0 a 100

	0	10	20	30	40	50	60	70	80	90	100	
Fai clic per scrivere la scelta 1												

Voglio che la biglia sia estratta dall'urna

- A (50% rosse e 50% nere)
- B (composizine ignota)

Il mio colore di vincita è

- Rosso
- Nero

Risultato Primo Round

La somma investita è ${e://Field/SIU1}

La somma non investita è ${e://Field/SNIU1} è uscito il colore ${e://Field/Estrazione1}

Hai vinto ${e://Field/V1}

Secondo Round

Secondo Round

In questo round la biglia sarà estratta dall'urna A (50% rosse e 50% nere)

Quanto vuoi investire? Inserire un importo da 0 a 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

Il mio colore di vincita è

- Rosso
- Nero

Risultato secondo round

La somma investita è ${e://Field/SIU2}

La somma non investita è ${e://Field/SNIU2}

Il colore estratto è ${e://Field/Estrazione2}

Hai vinto ${e://Field/V2}

Terzo round

Terzo Round

In questo round la biglia sarà estratta dall'urna B (composizione ignota)

Quanto vuoi investire? Inserire un importo da 0 a 100

	0	10	20	30	40	50	60	70	80	90	100	
Fai clic per scrivere la scelta 1												

Il mio colore di vincita è

- Rosso
- Nero

Risultati round 3

La somma investita è ${e://Field/SIU3}

La somma non investita è ${e://Field/SNIU3}

Il colore estratto è ${e://Field/Estrazione3}

Hai vinto ${e://Field/V3}

Quarto round

Quarto Round

In questo round potrai scegliere da quale urna estrarre la tua biglia, ma per scegliere l'urna A dovrai pagare 5 euro

Quanto vuoi investire? Inserire un importo da 0 a 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

Voglio che la biglia sia estratta dall'urna

- A (50% rosse e 50% nere)
- B (composizine ignota)

Il mio colore di vincita è

- Rosso
- Nero

Risultati Round 4

La somma investita è ${e://Field/SIU4}

La somma non investita è ${e://Field/SNIU4}

Il colore estratto è ${e://Field/Estrazione4}

Hai vinto ${e://Field/V4}

Terzo esperimento

In questa sezione sono presenti due piani di investimento. Nel piano A c'è un solo round e puoi investire fino a 400 euro. Il piano B è composto da quattro round e in ogni singolo round puoi investire fino a 100 euro. L'esito dell'investimento dipende da una lancio di una dado a sei facce. Potrai selezionare due numeri, in caso esca uno dei due numeri guadagnerai 2,5 volte il capitale investito, altrimenti lo perderai completamente. Il capitale non investito ha una rendimento del 5%.

Piano A

Piano A - investi fino a 400 euro in un unico round

Quanto vuoi investire? Inserire un importo da 1 a 400

	0	40	80	120	160	200	240	280	320	360	400
Fai clic per scrivere la scelta 1											

I miei numeri vincenti sono

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6

Risultati Piano A

La somma investita è ${e://Field/SIDA}

La somma non investita è ${e://Field/SNIDA}

è uscito il numero ${e://Field/NVA}

Hai vinto ${e://Field/VITTORIA}

Piano B - Primo Round

Piano B - Primo Round

Quanto vuoi investire? Inserire un importo da 1 a 100

	0	10	20	30	40	50	60	70	80	90	100	
Fai clic per scrivere la scelta 1												

I miei numeri vincenti sono

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6

Risultati primo round - PIANO B

La somma investita è ${e://Field/SIDB1}

La somma non investita è ${e://Field/SNIDB1}

Il numero estratto è ${e://Field/NVB1}

Hai vinto ${e://Field/WIN1}

Piano B - Secondo Round

Piano B - Secondo Round

Quanto vuoi investire? Inserire un importo da 1 a 100

	0	10	20	30	40	50	60	70	80	90	100	
Fai clic per scrivere la scelta 1												

I miei numeri vincenti sono

- ☐ 1
- ☐ 2
- ☐ 3

☐ 4
☐ 5
☐ 6

Risultati secondo round - PIANO B

La somma investita è ${e://Field/SIDB2}

La somma non investita è ${e://Field/SNIDB2}

Il numero estratto è ${e://Field/NVB2}

Hai vinto ${e://Field/WIN2}

Piano B - Terzo Round

Piano B - Terzo Round

Quanto vuoi investire? Inserire un importo da 1 a 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

I miei numeri vincenti sono

- 1
- 2
- 3
- 4
- 5
- 6

Risultati Terzo Round - PIANO B

La somma investita è ${e://Field/SIDB3}

La somma non investita è ${e://Field/SNIDB3}

Il numero estratto è ${e://Field/NVB3}

Hai vinto ${e://Field/WIN3}

Piano B - Quarto Round

Piano B - Quarto Round

Quanto vuoi investire? Inserire un importo da 1 a 100

	0	10	20	30	40	50	60	70	80	90	100
Fai clic per scrivere la scelta 1											

I miei numeri vincenti sono

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6

Risultati Quarto Round - PIANO B

La somma investita è ${e://Field/SIDB4}

La somma non investita è ${e://Field/SNIDB4}

Il numero estratto è ${e://Field/NVB4}

Hai vinto ${e://Field/WIN4}

RISULTATO FINALE

Il tuo guadagno complessivo è ${e://Field/FINALE}

Il rendimento dei tuoi investimenti è ${e://Field/RENDIMENTO} %