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Multidimensional Risk
A behavioural economics insight into the composition of risk for investors.

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"Believe you can and you're halfway there".

[Theodore Roosevelt]

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Introduction: Multidimensional Risk

Behavioural finance is undeniably an intriguing field of research, providing many layers to explore and important results to apply to many fields of daily life. With my thesis I aim at introducing the topic of Multidimensional Risk and, in particular, at analysing its components and relations with regards to investment decision making.

Multidimensional risk goes beyond the classical definition of financial risk, in fact, traditional decision theoretic conception of risk (academic decision theory definition of risk) does not explain completely choice behaviour and risk attitudes, but merely provides a number defining risk as the variance of a probability distribution. Indeed, within this classical framework it is difficult to find an empirical definition of risk. With this research I want to provide understanding for how an investor or a manager build different categories of risk, the so called multidimensional risk when they are faced with decision making processes under uncertainty.

As mentioned before, risk is not treated as a mere numerical indicator like classical theories imply, but it is a more complex group of risky elements and attributes affecting decisions.

The thesis is organized in four main parts: an introductive part, the presentation of the Multidimensional Risk Survey and tools employed, the analysis of questionnaire collected data and the final conclusions.

First of all, in chapter 1 the topic of risk is introduced and deeply analysed, both in its academic finance definition and also from a behavioural finance perspective. An extensive excursus on behavioural finance and prospect theory is also provided, followed by a presentation of the major heuristics and biases that affect decision making processes under uncertainty.

Chapter 2 enters the core work of this thesis by further illustrating the concept of multidimensional risk and explaining the main analysis objectives. It then proceeds by carefully illustrating the Multidimensional Risk Survey from the questionnaire design and topics to the tools employed in the collection of the data.

Chapter 3 follows with an analysis of the data collected with the survey. A first descriptive analysis of the sample population, of the results and main trends is provided, followed by a correlation analysis with R Program of the data and variables to get a further insight into the relations between risk components, categories, financial literacy levels and demographic features.

In conclusion to sum up chapter 4 provides an overview of the work done and draws the conclusions to see the impact of the survey findings and possible future applications.

Chapter 1: An Introduction to Risk

This introductive chapter is divided into two main parts.

The first one displaying the most important concepts surrounding risk in the classical economic theories and in financial literature to provide a range of definitions and a view of what the standard theories assumes when dealing with risk.

While the second, is focused on behavioural economics and on modern theories concerning risk and risk perception. A

Finally, the last paragraphs are dedicated to the understanding of two particularly important aspects related to risk in behavioural finance: familiarity and ambiguity. These two concepts are fundamental for the understanding of investors' behaviour and often play a crucial role in investment decisions.

1.1 A concept with many definitions.

This chapter aims at introducing the concept of risk. The goal of this first part is indeed to provide a framework of the classical definitions of risk in economics and finance in order to have a sound understanding of the academic concept and to be able to proceed with a deeper insight into the more recent concept of multidimensional risk, that is the core object of my thesis.

According to the Oxford English Dictionary, risk is the exposure to the possibility of loss, injury or other adverse or unwelcome circumstances; a chance or a situation involving such a possibility.

Speaking of business, risk is the potential of gaining or losing something of value (Kungwani, 2014). In financial markets, there is often the need to measure credit risk, information timing and asymmetries risk, sources risk, legal risk and model risk.

Broadly speaking however, risk is given by a mere number in finance: the variance, in case we refer to the single stock and its statistical variations; or the beta coefficient, which indicates whether the stock is more or less volatile comparing to the market, and represents a measure of the systematic risk which will be explained later on in this chapter.

When we invest, we hardly ever receive what we expected, otherwise the investment would be perfectly predictable and by definition risk-free. Therefore the return on an investment is given by an expected part and an unanticipated portion, a sort of surprise. It is these unanticipated events that constitute the risk of owning an asset.

Before talking of risky outcomes and decision making in risky situations, it is necessary to understand three basic concepts for describing risky outcomes: probability distributions, expected value and variance. A probability distribution is a depiction of all possible payoffs of an event whose outcome is uncertain and their

associated probabilities. The probability is obviously the likelihood that a particular outcome of one of these events will occur. There are two important properties of probability: the first one is that the probability of any outcome is between 0 and 1; the second that the sum of all possible outcomes regarding an event must be equal to 1. We will see later on in this chapter how this property will lead to the Ellsberg paradox and risk considerations going beyond the classical economic and finance theory. In these cases we can also talk about subjective probabilities, that is probabilities that reflect subjective beliefs about risky events. Different decision makers often have different beliefs about probabilities and different conception of risk. Indeed this is what this thesis aims at analysing, the behaviour towards risk of investors with different backgrounds and their multidimensional concept of risk. Some investors are more optimistic, others are strongly risk averse and so on.

As for the expected value, it can be defined as the payoff that an event with uncertain outcome may generate. The expected value is therefore given by the payoff an event may generate times the probability that it actually occurs. In the next session, the variance will be introduced.

1.2 The variance.

Stock returns can be displayed in a frequency distribution showing which the more volatiles stocks are. It is well known that government bonds are less volatile than common stocks, in other words, they have a lower variance. The variance is the averaged squared difference between the actual return and the average return (Ross, Westerfield and Jordan, 2009).

The variance therefore gives an indication of how volatile the stock is, of how much it deviated from the average return. The higher this number, the more volatile the returns are. Another measure of volatility is the standard deviation, which is the square root of the variance.

It is a measure of how spread numbers in a data set are and, in particular, how far they are from the mean. In statistics, the formula for the sample variance is the following:

$$\sigma^2 = \frac{\sum (X - \mu)^2}{N\text{-}1}$$

And it is given by the sum of the squared differences between the individual data point and the mean, divided by the number of values in the set (minus 1).

The figure below provides an ideal framework of how volatile and, therefore, how risky certain assets are. It is important to highlight that treasury bills are among the safest investments, as the low standard deviation shows and this is a very popular belief among investors. Investors aversion to risk will be analysed later.

Table 1.1: Historical Returns and Standard Deviations for Different Assets.

Asset Class	Average Annual Return (1926-2011)	Standard Deviation
Large-company stocks	11.8%	20.3%
Small-company stocks	16.5%	32.5%
Long-term corporate bonds	6.4%	8.4%
Long-term government bonds	6.1%	9.8%
Intermediate-term government bonds	5.5%	5.7%
U.S. Treasury bills	3.6%	3.1%

Source: Bank of America Merril Lynch,2011

1.3 Financial risk in investments.

When dealing with investments and returns, there is always an expected return and an unexpected return component, that is the risk. The investment is perfectly predictable and therefore risk free if we always receive what we expect from it. However, this is hardly ever true. The risk of owning an asset is made of unanticipated events.

Total risk = systematic (market) risk + unsystematic (diversifiable) risk

Talking about risk, there is a fundamental first distinction to be made by introducing the concepts of systematic risk and unsystematic risk. The former is defined as a risk that influences a large number of assets, the so called market risk. The latter is a risk that affects at most a small number of assets, an asset-specific risk (Ross, Westerfield and Jordan, 2009). For instance, uncertainties about general economic conditions are examples of systematic risk because they include GDP, inflation, interest rates etc. These are risks that cannot be avoided, indeed, they affect nearly all companies. On the other hand, the unsystematic risk is a more specific one, affecting only a sector as a strike of an oil company could be, causing problems to certain companies in the business, but not to all companies in the oil market.

In the investments field, unsystematic risk can be avoided or partially reduced by the process of diversification, that is spreading an investment across a number of assets (Ross, Westerfield and Jordan,

2009). This is a fundamental principle for building a balanced portfolio of investments and it is vital to diversify across industries but also within industries and on a geographical base.

The graph below shows the relation between diversifiable risk and non-diversifiable risk within a portfolio.

Table 1.2: Diversifiable and Non-diversifiable Risks in a Portfolio
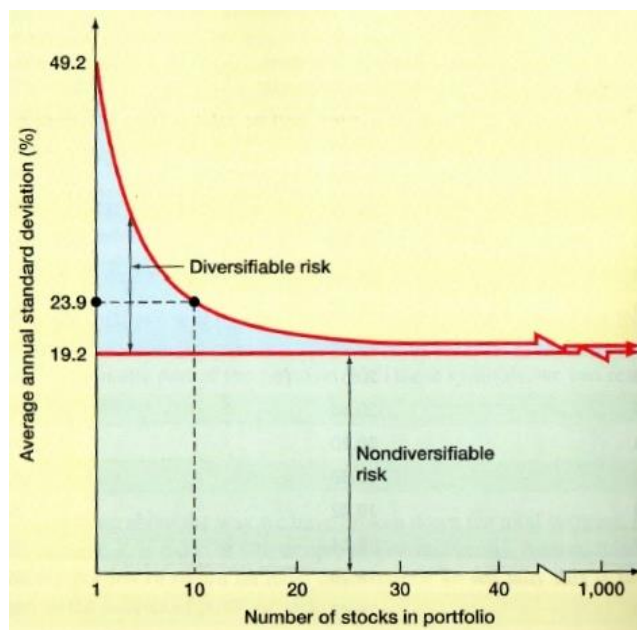
Source: Westerfield, 2009.

As the graphs explains, diversification reduces risk because with a large portfolio our investment does not fluctuate depending only from a company-specific events but fluctuation effects can be mitigated and spread among the several stocks in the portfolio, thus reducing the unsystematic (diversifiable) risk.

Investors who bear risk want to be remunerated and therefore the need for a measure of risk arises. The systematic component of risk is used to determine the expected return (risk premium) of the asset. The risk premium is defined as the excess return required by an investment in a risky asset over that required by a risk-free investment (Ross, Westerfield and Jordan, 2009).

As above mentioned, unsystematic risk can be reduced by diversification, but investors still bear the systematic risk and want to be remunerated for this. The systematic risk principle says that the expected return on an asset depends only on that asset's systematic risk (Ross, Westerfield and Jordan, 2009). This is a fundamental principle of the market, because indeed the market rewards only the risks that are unavoidable. The amount of risk an investor bears is a personal decision that will be analysed later on in this chapter and throughout the thesis work. The beta coefficient is the amount of systematic risk present in a particular risky asset relative to the risk present in an average risky asset (Ross, Westerfield and Jordan, 2009). It is a measure of a stock's volatility in relation to the market. Each stock is rated in relation to how much it

deviates from the market which has a beta coefficient of 1. The higher the beta, the riskier the underlying asset, the higher the risk premium and the expected return for the investor.

In the table below standard deviation and beta coefficient are shown for a couple of sample stocks.

Table 1.3: Total Risk vs Beta Coefficient

Stock	Standard Deviation	Beta Coefficient
Stock A	40%	0.50
Stock B	20%	1.50

Source: student elaboration

As the table shows, stock A has greater total risk, but lower systematic risk (the Beta is significantly lower than the one of stock B). Stock B, on the other hand, has a higher systematic risk (market risk or Beta) and will be therefore better remunerated in terms of risk premium even though it has a lower total risk (because part of it is avoidable with diversification).

In conclusion, the beta coefficient explains whether the investment is more or less volatile than the market and it shows the part of the statistical variance that cannot be eliminated with diversification (as said before, it represents the systematic risk) and it can be computed with a regression analysis against a stock market index. According to the systematic risk principle, the expected return on a risky asset depends only on that asset's systematic risk (Ross, Westerfield and Jordan, 2009).

The table below shows the values of betas and their interpretation.

Table 1.4: Beta Coefficient values

β values	Meaning
β<1	The investment is less volatile than the market.
β>1	The investment is more volatile than the market.

Source: Ross, 2009.

An average asset has a beta equal to 1 because it follows the movements of the market, while a beta equal to zero indicates that the asset is not correlated to the market, has no systematic risk. Finally, if the beta is <0, it means that the asset is moving in an opposite way than the market, inversely correlated.

In a market that works well, the reward to risk ratio of an asset (defined as its risk premium divided by its Beta coefficient) is the same for every asset.

Reward-to-risk ratio: $[E(R_i) - R_i]/\beta_i$

As a consequence, when asset expected returns are plotted against asset betas, all assets plot on the same straight line called the security market line (SML).

1.4 How risk is treated in finance: risk management.

As reminded in the previous paragraphs, risk in finance is the probability that an investment's actual return will be different than expected. This includes the possibility to lose all the initial investment or to gain something more. The relationship between risk and return is a fundamental one in finance, the more one is willing to risk, the more conspicuous the return for bearing the risk must be.

Risk management is the discipline that combines the recognition of risk, its assessment, the development of efficient strategies to manage it, and its mitigation with the use of managerial resources.

This paragraph very briefly analyses the **sources of risk**, which can be physical such as natural disasters or accidents, the environment, technology, organizations, politics and humans. The use of traded financial instruments allows the mitigation of risk effects, after the analysis of the capital structure of a company and the interests, because if a company is highly levered it is not a safe investment and needs risk management, especially if in a recession period. Financial risk arises in any transaction: loans, sales and purchases, legal transactions, investments, M&A, new projects, managerial activities, foreign activities etc. When financial prices change dramatically, it can increase costs, reduce revenues, or otherwise adversely impact the profitability of an organization (Kungwani, 2014). Investors for instance face an exchange rate risk when they have assets or investments in foreign markets or if they have loans in a foreign currency because there may be sudden changes in the exchange rate of the currencies.

It is important to keep into consideration these sources of risk when analysing decision making in uncertain conditions as it is interesting to see which aspects will then be considered as having a component in the multidimensional risk concept. For instance, some investors may find it important to know where they are investing: whether the country is safe, with positive sound prospects, with a stable government, indeed this is called sovereign risk in financial environments.

In conclusion to this little insight, once risk are identified through an analysis, the risk manager creates a plan to minimize or eliminate the impact of negative events.

1.5 Evaluating risky outcomes with utility functions.

Risky outcomes are generally described in economics with the help of tools such as probability distributions, expected values and variances. This paragraph aims at illustrating one of the classical decision making methods to compare and evaluate alternatives whose payoffs have different probabilities distributions and therefore different degrees of risk. Utility functions are a way to evaluate risky options in classical economic. As it is well-known, in microeconomics, a utility function is a measure of satisfaction given by the consumption of a bundle of goods and/or services.

The picture below shows three different utility functions: for a risk-averse decision maker, for a risk-neutral decision maker and for a risk-loving one, respectively.

Table 1.5: Utility Functions and Risk Attitudes
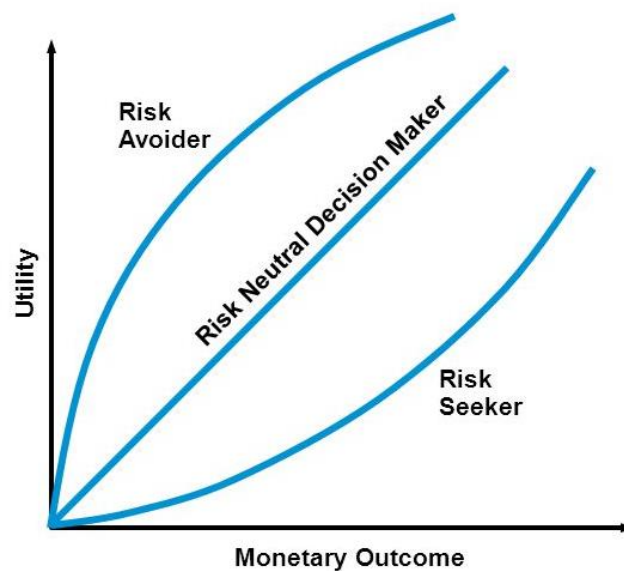
Source: Besanko, 2011.

In order to illustrate the decision making process made with utility curves, suppose one has to choose between starting to work for a large consolidated company, giving a salary of $46000 per year and a startup company which can assure a symbolic salary of $6000 plus a possible bonus of $80000 in case the company launch is a success with a 50% probability to get or not the bonus.

Clearly, the decision to be taken is between a certain event (the consolidated company) and a risky event (the startup company) that may yield to extremely positive results (salary plus bonus) or poor results (in case of failure of the company. The first assures a salary of $46000, while the second may make the person rich quickly with a total of $86000 or very poor with only $6000, with a 50-50 probability. However, the expected values of the two salaries are equal: the first (expected salary of consolidated company) is obviously $E(S_C) = \$46000$, while the second (startup expected salary) is given by $E(S_S) = \$6000 + 0.5 *$ $\$80000 = \$46000$. In order to make a decision and evaluate the two alternatives, one may use a utility function.

1.5.1 Risk-averse decision maker.

In the case of risk aversion, the utility curve displays diminishing marginal utility because an increment to income increases utility by much more when the income is low, while the effect on utility is lower as the income rises. Reworded, a poor person values an increase in income a lot, while a rich person is not particularly affected by such an increase in income because his/her level of satisfaction is already high.

Table 1.6: Utility Function and Risk Aversion
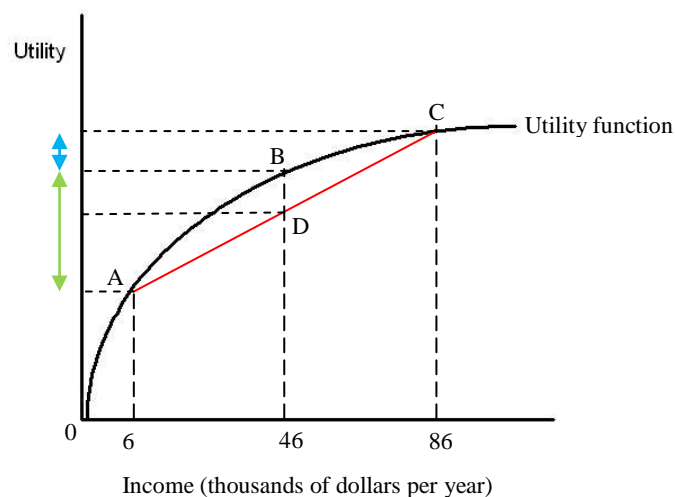
Source: student elaboration.

Point A: it represents the utility level assuming that the startup company will not be able to give the bonus and therefore will grant only the basic symbolic salary of $6000 (50% probability for this event).

Point B: represents the utility achievable by choosing the job at the secure, consolidated company which provides an income of $46000 per year.

Point C: it represents the utility level achievable in case the startup company gives the bonus (50% probability).

Point D: represents the <u>expected</u> utility given by the startup job.

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The expected utility is the expected value of the utility levels that the decision maker receiver from the payoffs in a lottery (Braeutigam and Besanko, 2011).

In conclusion, because the expected utility with the consolidated company is higher than the expected utility of the start-up company, the person will prefer to work for the consolidated firm, avoiding risky options. This was indeed an example of a risk-averse person, one who prefers a sure thing to a lottery of equal expected value. In general, a utility function that shows diminishing marginal utility implies that the utility of a sure thing will exceed the expected utility of a lottery with the same expected value (Braeutigam and Besanko, 2011).

The blue line shows the upside effect, whereas the green line represents the downside and it has clearly a greater impact. Because of diminishing marginal utility, the reduction in utility given by the downside is bigger than the gain in utility given by the upside. In other words, the hurt suffered by the person in case of a downside is of greater weight with respect to the gain he/she would have in case of an upside in the lottery. This is why the risk-averse decision maker has the tendency to choose the more safe and sure option.

1.5.2 Risk-neutral decision maker.

In the case of a risk-neutral attitude, the decision maker compares lotteries and options only according their expected values and is therefore completely indifferent between a sure thing (salary in this case, or investment returns in the case of an investor) and a lottery with the same expected value.

The risk-neutral decision maker has a linear utility function (U = a + bI). The function is therefore a straight line, the marginal utility of the income is consequently constant, therefore there is not the effect that there was in the risk aversion case.

Table 1.7: Utility Function and Risk Neutrality

Source: student elaboration.
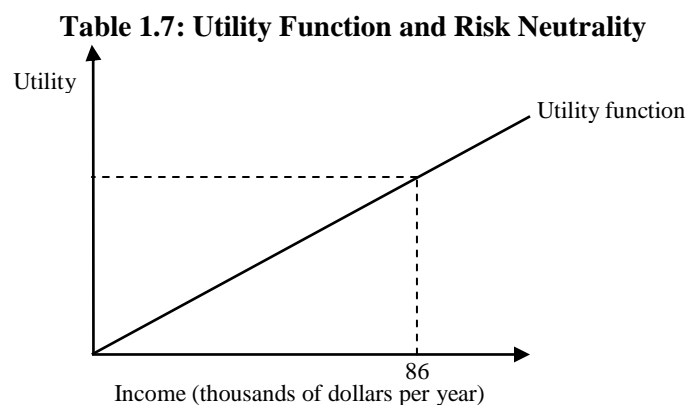
1.5.3 Risk-loving decision maker.

A risk-lover decision maker is a decision maker who seeks risk, and prefers a lottery to a certain sure event which has the same expected value overall. In the case presented above, the utility coming from the risky job

at the startup company would exceed the utility given by the secure consolidated company. Indeed the utility function in this case exhibits increasing marginal utility as shown in the sketch below. The utility goes up as the increase in the decision maker income goes up.

In fact, if offered either $50 or a 50% each chance of either $100 or nothing, a risk-seeking person would prefer the gamble even though the gamble and the sure thing have the same expected value.

Table 1.8: Utility Function and Risk-loving

Utility

Income (thousands of dollars per year)
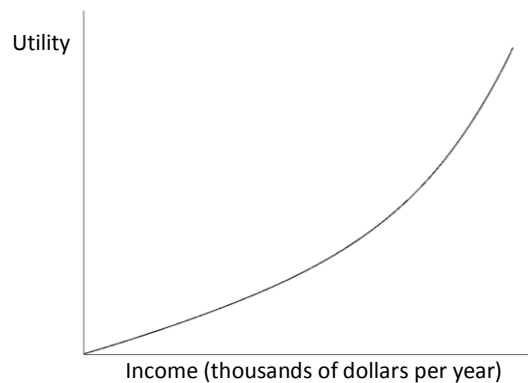
Source: student elaboration.

In real life, the decision between the two jobs options is undeniably affected by many other issues such as, for instance, the long-term prospects of the firms' earnings, the locations and other non-monetary characteristics of the two jobs, the nature of the work, the familiarity of the company, working hours etc. This is why it is important to go beyond the mere definition of risk in economic terms, to understand the components of risk in the decision makers' minds, to get an insight into what is considered when making such a decision, which is a parallel concept to an investment: when someone chooses a job, the decision is about how to invest their time. In the next chapter, the topic of multidimensional risk will be presented and further investigated before arriving to the questionnaire and analysis part of this thesis.

1.6 Academic Finance Perspective

Before entering the fascinating world of behavioural economics and behavioural finance in particular, hereafter follows a brief excursus on the pillars of the conventional financial theory.

According to traditional economic theories investors are people who make **rational decisions** in order to **maximize** their **utility** and **optimize** their **choices** (Braeutigam and Besanko, 2011).

Rationality of investors is a concept defined by Ricciardi (2008) that inclused:
1. Making optimal decisions.
2. Investors' objectives are financial in nature and are assumed to maximize wealth.
3. Unbiased expectations of individuals regarding the future.

4. Individuals act in their own best self-interest.

This standard finance viewpoint states that investors take decisions according to the **efficient market hypothesis**, indeed since the '60 these hypothesis have been within the most important theories in standard finance. According to the efficient market hypothesis investors process information instantaneously, there is **perfect information** and therefore asset prices fully reflect all the existing information (Fama, 1965).

As a consequence to this theory, it is **impossible to "beat the market"** on a risk adjusted basis as the market prices should only react to upcoming new information. Investors are therefore **rational individuals**, making rational and informed choices as the stocks are always traded at their fair value, not allowing room for over inflated sales or undervalued purchases. In these conditions, even with a smart stock selection and market timing, it is impossible to outperform the market. The only way to get higher results is by chance or by bearing more risk and therefore obtain higher returns according to the risk-return ratio.

Under these hypothesis, investors are rational individual meaning they act and invest only basing their decisions on new information, not on intuition or emotions (Nichols, 1993).

The standard finance rational economic decision making implies that all individuals are wealth maximizers selecting the most preferred choice maximizing the individual utility or value function; this is possible assuming that the investor possesses complete knowledge of the market and stocks and employs a well-structured decision making process based on profit maximization and an in depth search for information and analysis of alternatives with no time constraints. By making such informed systematic decisions the rational decision maker acts in a world of complete certainty. Skills such as computational ability are given for granted in these theories, suggesting that with rationality individuals and companies are able to predict future events without biases and with the perfect timing and availability of information (Ricciardi, 2008).

These assumptions are an issue that arouses strong feelings and debates among academics, some firmly believing that the market perfectly prices assets, others stating that investors are not rational individuals and that there is often lack of information – asymmetry - and agency problems.

There are three types of **market efficiency** to be taken into account:

- The weak form: the market is efficient because the history of all past market prices and information is fully reflected in securities values.
- The semi strong form: the market is efficient in that all publicly available information is reflected in securities values.
- The strong form: the market is efficient because all information is reflected in securities prices.

The **objective** of an investor acquiring stocks is to increase his/her **financial wealth**. Under this perspective and traditional finance point of view, it would be futile for investors to apply certain investing techniques because an investor's expertise and prospects are already reflected in either a specific stock price or in the overall financial market. Thus, it would be pointless and unrealistic for investors to spend their precious time and resources in trying to outperform the market (Ricciardi, 2008).

Even though it is not the objective of this thesis, the major **paradigms of traditional finance**, all fundamentally assuming the rationality of investors, can be briefly summarized as follows:
-portfolio allocation based on the relationship between expected return and risk;
-risk-based asset pricing models such as the CAPM (Capital Asset Pricing Model) and other similar frameworks;
-the Miller-Modigliani theorem and the theory of agency.

According to conventional economics, emotions and other factors do not influence people when it comes to making economic choices because people are thought to be **rational wealth maximizers**.

Academic finance, however, does not completely explain why individual investors trade, how they choose their portfolios and why returns vary across stocks for reasons that go beyond risk. Corporate finance as well is a field in which there are many issues that do not conform to traditional financial models and lack explanation, very often mergers and acquisitions and capital structure decisions are an example of these unconformities.

1.6.1 Towards new perspectives.

In contrast, professional investment managers and behavioural finance experts do consider the existence of market inefficiencies (for instance the **January effect**, presenting a seasonal increase in stock prices possibly due to the fact that investors use year-end cash bonuses to buy investments in January).

Like the January effect, there are other regularly occurring **anomalies** that directly violate modern financial and economic theories as they do not imply rational decisions. These anomalies triggered and sustained the development of behavioural economics studies. Among these, there is also the so called **Winner's curse**, a phenomenon in which the winning bidder in a common-values auction might bid an amount that exceeds the item's intrinsic value (Besanko, 2011). The differences in pricing occurring in these occasions are a clear sign that participants in the bidding process do not have the same information on which to base their valuation or that they price differently due to some other factors not directly connected to the bidding. According to Richard Thaler's 1988 article on winner's curse, there are two primary factors that undermine the rational bidding process: the number of bidders and the aggressiveness of bidding.

These are just a couple of anomalies that conventional financial theory does not account for in the real world. It is not to say that conventional financial theories are not valuable, but rather that the addition of behavioral finance can further clarify and investigate how financial markets works.

The market is inefficient whenever there is **information asymmetry**, implying there are some people who have more information than others and that are thus able to make better investment decisions. Furthermore, asymmetry of information implies **arbitrage opportunities**, meaning that there is the opportunity to find mispriced assets and generate greater returns (Ricciardi, 2008).

The existence of market inefficiencies leads to implications that are fundamental in the behavioural economics and finance researches: people are willing to try to exploit and find these arbitrage chances and often act in an irrational way making judgments that do not comply with the strong assumptions of profit maximization and rationality. Indeed this demonstrates that people are often driven by other factors than rational reasoning such as cognitive processes and affective or emotional factors. This results in investor perceptions being influenced by their own personal risk judgments on a particular asset under valuation and in their failure to detect their best investment option by selecting a stock/other asset influenced not by rational thinking but by emotions and other issues such as familiarity etc. as will be explained further on in the next paragraph and throughout the thesis.

1.7 Behavioural Economics and Prospect Theory Perspective.

1.7.1 Behavioural Economics and Finance.

Behavioural economics and one of its branch, behavioural finance, are disciplines that study how behaviours and decisions are affected by psychological, social, cognitive and emotional factors. These **studies** are important because these effects have consequences on market prices, returns and resource allocation as they characterize the economic decisions taken not only by individuals but also by institutions (Lin, 2012).

Imperfections in financial markets are attributed to a combination of cognitive biases such as overreaction, representative bias, information bias, overconfidence and many other factors developed by human misprocessing of information and common mistakes in reasoning.

Though on the one hand it is true that the market processes a lot of information and reflects it into share prices that generally rise as the amount of information disclosed increases (Farvaque et al., 2011), on the other hand it is nevertheless true that there is still room for **information asymmetry** as the quality of the information disclosed may not be high and not all companies comply to the same levels of information disclosure. Rating agencies such as Standard and Poor's assign transparency score takes into account the

quantity of disclosure: the more information is given (regarding the ownership structure, financials, shareholders rights, management), the higher the score is. Improvements in the quality of information in fact reduces information asymmetry that prevails among investors. This asymmetry allows informed agents to make profits to the detriment of uninformed agents, through what is known as informed trading (Farvaque et al., 2011) and creates opportunities for arbitrage.

Decision makers therefore possess only limited information in the case of information asymmetry. According to Simon (1956), investors in these situations do not always seek for the best potential choice because of limited resources and personal inclinations, thus becoming mere satisfiers and not maximizers.

Regarding information, it is important to question the assumptions of the EMH (Efficient Market Hypothesis) as Faust (1984) did wondering whether investor process information in an efficient, logical and neat way. In addition to this unsatisfied assumption there another important issue arises nowadays: **information overload.** It is defined as a situation that occurs when the information processing demands on an individual's time to perform certain actions and calculations exceed the supply or capacity of time available for the processing (Schick, Gordon, Haka, 1990).

The poor judgment abilities of individual investors are constantly being challenged by the enormous amount of information and data available nowadays: the abundant investment choices and the advancement of information techniques and the Internet provide investors, academics and professional consultants with an overwhelming flow of resources to analyse. Bulletins, chat rooms, dedicated websites, blogs, and trading rooms are just a few to mention.

This information overload makes it even more difficult to take investing decisions and indeed it makes the use and application of heuristics even more attractive. Complicated tasks are indeed a synonym of tasks with lots of information to be analysed and taken in. Heuristics on one hand are simplifying decision strategies that require less cognitive effort, but on the other hand, they are less accurate and precise than more complex decision making strategies (Paredes, 2003).

In brief, information is good, but may it may as well lead to bad decision if the investor is not capable of properly analysing it and if it comes in an overwhelming amount (Ricciardi, 2008).

Behavioural decision theory departs from the traditional, solely statistical econometric and mathematical models in which rationality is the core assumption. It has provided insight into a more descriptive model of human behaviour, investigating the way people make decisions and understanding that investors do not constantly comply to the normative of classical finance by miscalculating probabilities (investors are well known for not having a complete panoramic of the whole probability distribution of an event and under or over estimating probabilities) and, secondly, by entrusting non-economic factors in the decision making processes. Indeed, the behavioural decision maker is influenced in his/her judgment process by what is felt, perceived, remembered in a particular situation or event or circumstance.

A fundamental role in behavioural economics is played by **bounded rationality**, that is the fact that decision makers are severely limited by their values, unconscious inclinations, skills possessed and habits (Simon, 1997). Bounded rationality implicitly states that economic rationality has its considerable limitations, especially if the decision making process is happening under conditions of risk and uncertainty as in the case of the analysis of this thesis and, more in general, in the case of all investors. In one of his researches, Ricciardi (2008) illustrated how investors prefer to identify themselves in models of bounded rationality against models of standard finance and strict rationality assumptions.

At the basis of behavioural finance is the assumption according to which investors are **irrational** or at most hardly ever rational (Thaler, 1994). **Inconsistency** of choices is another element that characterizes investors in the behavioural economics world and emerges in many surveys.

The table below summarizes the critics made by Simon (1947) with respect to the concept of rationality assumed by the classical economic theories.

Table 1.9: Criticism on the limits of standard rationality.

1. Rationality necessitates of complete knowledge and anticipation of the consequences that will derive with respect to each choice. Nevertheless, consequences are not always known in advance.

2. The consequences of investors' choices lie in the future and the value deriving from them may not have been experienced in the past. So imagination covers the lack of values, which are therefore only imperfectly anticipated.

3. Rationality requires a choice among all possible alternative behaviours, however, in real behaviour, only a limited number of these alternatives comes to mind (Simon, 1947).

Source: student elaboration

Cognitive processes are the mental mechanisms that human beings make use of in order to process information and solve problems during the decision making processes (Ricciardi, 2008). They are basically mental skills allowing the comprehension and recognition of what surrounds an investor, in this case. The behavioural economics literature on studies about the irrationality of human behaviour is wide, proving the illogical attitudes towards money management, finances and investment decisions (Kahneman, Slovic and Tversky, 1982; Piatelli-Palmarini, 1994; Olsen, 1998; Ricciardi, 2006).
Cognitive aspects concern the way people mentally organize their information they have available as explained by Shefrin (2000), while the emotional aspects deal with the way people feel when they register information.

Indeed, financial decision makers are neurologically predisposed to incorporate feelings and emotions (affect) into the decision making process according to Olsen (2001).

Among the factors that influence **investors' judgment** are some internal and external **factors**.
On the internal side there is undoubtedly the psychology of other individuals or group that act in the market place; conversely, on the other hand, there are the past experiences of the investors providing favourable or unfavourable memories of a precedent investment decision. This memory can obviously be positive or negative depending on the final outcome of the decision, gains or losses respectively.

Furthermore, what is fundamental to take into consideration when supporting behavioural economics theories against traditional finance and the efficient market hypothesis is that not all investors and shareholders have the same level of **financial literacy** – defined as the possession of knowledge and understanding of financial matters (OECD/INFE international survey of adult financial literacy competencies, 2016) – and that therefore there is room for misunderstanding of the information disclosed and consequently of bad decision making. Indeed, this is one of the aspects that will be analysed through the multidimensional risk questionnaire presented in chapter 3.

Behavioural economics and behavioural finance are strictly related to **risk tolerance** which is defined as the individuals willingness to engage in a financial activity whose outcome is uncertain (Chivali, 2016). Risk will be deeply studied and analysed in chapter 2. Behavioral models typically integrate insights from psychology, neuroscience and microeconomic theory, covering a wide and important array of concepts, methods and application fields (Milton and Kahle, 2013).

The **macro topics** in behavioural finance are:

- Heuristics: a problem solving method based on rules of thumbs that allow quick decisions and responses but do not assure optimal approaches to the issues.

- Framing: including all the anecdotes and stereotypes that make up the mental emotional filters (frames) individuals rely on to understand and respond to events based on previous personal experiences and similar/connected feelings.

- Market inefficiencies: mispricing, information asymmetries and non-rational decision making behaviours.

Historically speaking, behavioural economics was born in the '60 when cognitive psychology started to provide more insights on the brain intended as an information processing device. Psychologists researches such as Tversky and Kahneman began to compare their cognitive models of decision-making under risk and uncertainty to the traditional economic models of rationality bounded choices.

This discipline is very important in financial education because it can provide insights into the most common **mistakes** investors make and in what strategies are likely to work in financial markets (Subrahmanyam, 2007). It underlines inefficiencies as under reactions or overreactions to the disclosure of information causing market trends and in more extreme cases of market bubbles and crashes. The reasons behind these **extreme behaviours** are to be sought in investor behavioural characteristics such as attention, overconfidence, excessive optimism.

One of the most absurd **economic bubbles** in history is undeniably the tulip fever or tulipomania that affected the Dutch Golden Age increasing the prices for bulbs at incredible heights after the introduction of tulips for then collapsing short after. An economic bubble is a situation in which asset prices considerably outstand their intrinsic value. The tulip was different from every other flower known to Europe at that time and in fact it soon became a status symbol. The peak of tulipomania was reached in 1636 when some bulbs were exchanged even ten times in a day. Speculation in the tulip market was a must do and people were trading even dozens of acres of land for a single tulip bulb. Investors were then ruined by the fall of the prices as the situation was not sustainable for obvious reasons. It is undeniably a rather extreme example but it serves the purpose of explaining that people's behaviour is not always rational and predictable, there are many factors behind it. This is to say that behavioural finance tries to explain behaviours of investors and mark common cognitive mistakes deriving from framing, heuristics, familiarity issues etc.

In contrast with the investors' rationality assumption of academic finance there are many studies of behavioural finance providing support to other factors influencing individuals decision making. Saunders, (1993) for instance, provided empirical evidence that the NYSE (New York Stock Exchange) market has the tendency to earn positive returns on sunny days and average results on cloudy days. This result is also supported by studies on international markets (Hirshleifer and Shumway, 2003) suggesting that the **mood** of investors has an impact on their decisions and therefore on the stock market itself. Huberman (2001) highlights how investors prefer stock that are close to the region they live in.

Another example is the **familiarity hypothesis** (which will be further analyzed later on in the chapter) according to which individuals prefer stocks with high brand recognition (Frieder and Subrahmanyam, 2005). Furthermore, the preference for **local stocks** is a feature characterizing not only individual investors but also mutual fund managers (Coval and Moskowitz, 1999) as they prefer to invest in stocks headquartered in the region in which they operate with their company. In addition, as showed by Hong et al (2005), managers are more likely to buy stocks that fellow managers in the same city are buying as well, providing evidence that portfolio decisions are also a matter of the so called word of mouth effect among managers and investors. In conclusion, this is to say that financial markets are driven, at least in part, by **irrational agents**.

In the table below is a general overview of the points on which standard finance and behavioural decision making debate.

Table 1.10: Points of debate between the two theories.

Standard Finance	Behavioural Finance
Rationality: individuals make logical and coherent financial and investment choices.	Rationality is bounded to knowledge, understanding abilities, skills, time, cognitive limitations, heuristics and affect (feelings).
Investors are not affected by emotions in their decision making processes.	Investors are influenced by psychological factors that prevent them from making optimal investments decisions.
Explains how markets operate as an aggregate.	Explains how individual investors actually behave.
Judgments are made within a clearly defined set of circumstances, all possible alternatives and consequences known.	Judgments are made in information asymmetry situations, or with information overload without having a complete view of the situation/outcomes.
Decisions are taken through the application of a complex strategy.	Decisions are often taken with the use of heuristics to simplify the problem.
The choice is the optimal outcome.	The choice is a satisfactory outcome.

Source: student elaboration

1.7.2 Behavioural finance: key concepts.

For this thesis work it is fundamental to learn more about the main theories and concepts of behavioural finance and economics because they are all aspects to be considered when analyzing the individuals' perception and idea of risk and how it may be influenced.

Heuristics.

When people have to deal with complex situations and judgments, in the specific case of economics and finance environments with probabilities and investments decisions, the general trend is to use a number of heuristics to make the task simpler and clearer. Heuristics are rules of thumbs that make the judgment process faster as they cut some steps of reasoning, they are cognitive tool for mental shortcuts.

Myers (1989) refers to heuristics as a repertoire of strategies based on pieces of knowledge acquired in the past, rules learned by doing, or hypothesis that worked in the past. The use of heuristics is very popular because as previously said they reduce the time of the decision making process for an individual investor.

According to Ricciardi and Simon (2001) make a clear and direct definition of heuristics: mental shortcuts or strategies derived from four past experience that get us where we need to go quickly, but at the cost of sending us in the wrong direction or introducing biases that result in over or underestimation of the actual outcome.

Anchoring.

Anchoring is one of the key concepts in behavioural economics and finance, as it is important to understand that people have a tendency to "anchor" to a reference point and consequently absolute evaluation is difficult. The process of anchoring is used by an individual to solve intricate problems of a decision-making process by selecting a reference point and adjusting to arrive to a final judgment and decision (Ricciardi and Simon, 2001). Anchoring is a frequent phenomenon when people are faced with new concepts and situations and are somehow forced to find a solution starting from the previous similar experiences/past events/trends. Indeed, this is also what broadly speaking a marketer does when projecting the sales of a product for the upcoming year: the reference or starting point is the volume of the past years sales.

A common example to explain anchoring is provided by Hammond, Keeney and Raiffa (1998). In one of their studies they asked their candidates to ask the following simple questions:

- Question 1: Is the population of Turkey greater than 35 million?
- Question 2: What's your best estimate of Turkey's population?

Not surprisingly, most of the people were influenced by the formulation of the first question when answering the second one and used 35 million as a starting point for their evaluation of the population. This simple study proved evidence that, when making judgments, individuals' minds improperly consider as significant some original information, or overweight its real value (Hammond, Keeney and Raiffa, 1998). Choices and benchmarks are anchored to first impressions, rough calculations, memories or statistical figures presented.

Anchoring is present also in investments as investor often base their decisions on wrong figures.
Revising an intuitive, impulsive judgment will never be sufficient to undo the original judgment completely. Consciously or unconsciously, we always remain anchored to our original opinion, and we correct that view only starting from the same opinion" (Piatelli-Palmarini, 1994).

Mental Accounting.

Mental accounting is an interesting aspect of behavioural economics especially when dealing directly with investors and savers. It the set of cognitive operations used by people, households and investors to organize, evaluate and keep track of financial activities (Thaler, 1999).

Mental accounting is about how outcomes are perceived and taken in, how different activities (such as holidays, loans, housing, mortgages, school…) are categorized and indeed put into different accounts according to their sources and intentional use, and, finally, about how often these accounts are balanced (are they checked daily, weekly, yearly etc.). Mental accounting influences choices and although apparently an economic way of thinking, it is often rather irrational: a person may be saving money for the house, but paying lots of interests on a loan just because these expenses are into two different, completely separate accounts. Rationally speaking, it does not make any sense. Money should be fungible, treated the same way (Thaler, 1999).

Investing is particularly affected by this mental bias, it is common among investors to divide their investments between a safe portfolio and a speculative one. This is done in order to preserve the safe portfolio from the possible losses of the speculative one. The net wealth will not be different if he had had a bigger portfolio. It is important to underline that the reasoning behind this behaviour is the fear of losses, implying asymmetry of risk. This aspect will be deeply analysed in the second and third chapters.

Confirmation bias.

It is in human beings nature to look for confirmation evidence rather than disconfirming one, there is a tendency for positive tests in people's minds. This bias applies to all fields, from human resources management where candidates are selected according to the characteristics they should have while little importance is given to what they lack. It is a kind of selective thinking that bases on the knowledge we already have about an issue and looks for confirmation and support of this. More attention is paid to information that supports what is already know, whereas little or no credit is given to the rest, leading to a misinterpretation of information and to bad decisions. It is a rather dangerous bias in investing because investors tend to look for information that support their initial idea of the stock, while they tend to avoid information that goes in contrast with what they think. A good practice to avoid the confirmation bias is to always look for another opinion, better if contrasting, before taking a decision.

The issue of perceived control.

The relation between control and perceived risk is a widely studied topic in behavioural finance, as individuals like to feel influential on the outcomes of an event. The two forms of control identified by these social sciences are the external versus internal control and the perceived control. The former, illustrates the degree to which a person is able to control his/her own behaviour, while the latter deals with the perceived control on outside factors that may influence the final outcome of an event (Rotter, 1971).

According to MacCrimmon and Wehrung (1988), perceived control in the field of investments makes investor believe that thanks to their expertise, skills, knowledge or abilities the can avoid large losses or bad investments as if there were a sort of control on the outcomes of the investments chosen.

Representativeness.

In order to elaborate information, people tend to start from stereotypes and situations that are somehow familiar to them. People form an opinion of events according to how much they remind them of other events with which we are familiar with.

It is another mental shortcut that however makes it complicated to accurately study and understand financial information regarding investments. According to Busenitz (1999), individual who present this heuristic are willing to develop broad generalizations about a phenomenon based only on a few attributes of the event.

At the basis of representativeness is the thought that the member of a category (for instance, hazardous activity or risky behaviour) should resemble other elements of the same class and consequently resemble also the cause that produced it (Ricciardi, 2008).

Individuals have an intrinsic inclination to make judgments based on the similarity of elements, or to predict uncertain future events according to a small amount of data and drawing a holistic conclusion (Ricciardi and Simon, 2001). In finance, this heuristic finds wide application among investors. Eaton (2000) summarizes it as follows: two companies that report poor results may be both classified as poor companies, with bad management and unexciting prospects. This may not be true, however. A tendency to label stocks as either bad-to-own or good-to-own based on a limited number of characteristics will lead to errors when other relevant characteristics are not considered.

Regression to the mean.

The regression to the mean is a statistical phenomenon according to which if a variable is extreme on its first measurement, it will tend to be closer to the average on its second measurement.

Such instances of regression to the mean occur whenever there is an element of chance in an outcome. For instance, short parents tend to have taller children even though "common opinion" is that they would have short children as well.

Indeed regression to the mean is a very important concept in statistics that has fundamental consequences in finance too. Even so, it is still a counterintuitive concept to understand. Kahneman and Tversky (1973) suggested that the representativeness heuristic accounts for this systematic bias in judgment. People find regression to the mean a difficult concept to logically understand because individuals typically assume that future outcomes (for example, this year's sales) will be directly predictable from past outcomes (last year's sales).

The tendency is to think that predictions come based on the assumption of perfect correlation with past data (Bazerman and Moore, 2009).

In some unusual situations, however, individuals do intuitively expect a regression-to-the mean effect.

Consider for example a student getting always 18 and nothing more. When he/she gets a higher grade, say 30, his or her parents will not expect the performance to repeat in the next exam. Again, when a real-estate agent sells five houses in a month (an outstanding, high performance), his colleagues do not expect equally high sales from him the following month.

In these last two cases, regression to the mean seems to be more intuitive and easy to understand. This happens because when a performance is extreme, people unconsciously know it cannot last.

In unusual circumstances, the expectation is for performance to regress, but in less extreme cases the effect of the regression to the mean is not recognized.

Same thing happens to financial markets: whenever there is a casual component, an element of chance, there is the effect of the regression to the mean. In the long run, the price of a stock always regress to its mean.

The confirmation trap.

People naturally tend to seek information that confirms their expectations and hypotheses, even when disconfirming or falsifying information is more useful.

In order to explain this bias, a simple example may be considered. Supposing the question is to guess what rule underlies a sequence of three numbers such as 2-4-6, results are interesting and granted.

The great majority of people involved in such an experiment normally answer that the rule is writing numbers that increase each time by two.

The experiment is repeated several times until somebody finds the right answer. The idea behind this sequence is write three numbers that increase.

Clearly, this happens because when we see this sequence our mind immediately looks for confirmations. Whenever we encounter information that is consistent with our beliefs, we usually accept it with an open mind and a glad heart (Bazerman and Moore, 2009).

This experiment was conducted by Wason (1960) and the conclusion drawn were that obtaining the correct solution necessitates 'a willingness to attempt to falsify hypotheses, and thus to test those intuitive ideas that so often carry the feeling of certitude.

There are two main reasons for which human beings and investors when seeking information fall into the confirmation trap.

First of all, there is the fact that human mind is designed to recall information from memory. It is the way we are made and there is nothing to do about it. People have the tendency to retrieve information, in a natural way. We always look for information in our memory. A shocking experiment was conducted by Loftus (1975) showed that this tendency is so strong that it is even possible to implant somehow people with false memories. In his experiment people were given a movie to watch about an accident. When half of them were asked a specific question about something that was not in the movie, most of them became dramatically more likely to recall seeing this element in the movie.

Another reason for falling into the confirmation trap is due to the way in which people seek for information. There is the tendency to search selectively for information or give special credence to information that allows individuals to come to the conclusion they desire to reach (Kunda, 1990).

So an investor, despite the incredible amount of information available, will inevitably have the tendency to look for information confirming the ideas he or she already has. Sometimes a useful piece of advice would be to look for information that discard the opinion or knowledge one already has about a topic/stock/company in order to get a more complete picture of the scenario.

Gambler's fallacy.

The gambler's fallacy is a consequence of a lack of understanding assumptions and predictions in the field of probability. The common thought that if an event did not happen in the past it will not happen now, is completely wrong and dangerous especially when it comes to investing decision making.

The wrong essence of this fallacy is that past events do not change the probability that certain events will occur in the future.

In economics this is a very common phenomenon, one of the most common (wrong) beliefs is that if a company has performed well in one year, it will perform less well the next year. It is a wrong interpretation of the regression to the mean. Indeed, in financial market as well investors believe that they should liquidate a position in a stock if it has already gone up in several serial trading sessions because they do not think that the position is likely to continue going up. In contrast, other people might stick with a stock that has fallen through different trading sessions because they think ulterior decreases are not likely to occur. As in the coin situation, the fact that the stock has gone upwards for a certain number of sessions does not imply that in the next session it is less likely to go upwards. Investment decisions should be made according to fundamentals analysis and technical considerations.

Overconfidence.

Overconfidence is a typical aspect to be analysed in the financial behaviour literature as it influences the risk perception of investors. It is something that affects decision-making processes and results. According to Weinstein (1980), 93% of American drivers estimate themselves as above the median. Overconfidence is the belief in oneself with full conviction taken to an extreme (Ricciardi and Simon, 2001). Indeed as human beings there is the inclination to overestimate personal skills and abilities, there is the general tendency to overestimate the accuracy of our current knowledge and future predictions. According to a survey by Montier (2006), 74% of professional fund managers think to have offered a performance higher than the average; while the remaining 26% consider itself in the average.

Overconfidence is much stronger when the task considered is difficult, when there is low predictability of outcomes and when the feedback is scarce or not precise. Overconfidence does not allow people to properly estimate risks. There is also a gender effect on overconfidence, indeed men are more overconfident than

women, Prince (1993) stated that men are inclined to feel more competent than women do in financial matters.

Furthermore, overconfidence is also about the "it won't happen to me" bias. People think of themselves as invulnerable to certain risks and events. Indeed this is what happens with insurances, most of the times people do not make an insurance because they motivate themselves saying "it won't happen to me" and only go for it after, say an earthquake, destroys their house. Without knowing that after a major earthquake has occur, it is less likely that another will occur. People only buy insurance after the undesired event has occurred. This effect is also called overestimation of vivid information.

Availability heuristic.

Tversky and Kahneman (1973) have extensively studied availability as a fundamental component of risk perception. This heuristics is concerned with the frequency of an event: people tend to be biased by information that are more easily available to them, easy to recall because it is recent, vivid in their memory or well-advertised. An event is thought of as very probable and likely to occur if they are easy to remember and visualize. This implies that people are lazy on the one hand, because they wait for information coming to them instead of seeking for it, they tend to base their decisions according to more recent information, making any new opinion biased toward that latest news they have.

To avoid the biases coming from this heuristic it is vital to maintain a clear overall picture of the investments and of the whole timing: it is easy to be confused by the latest news and short term approaches to investments and trading often lead to poor results, focusing on the long term is generally a good way to avoid this availability bias. For instance, after an airplane accident occurs, people are more afraid to flight and prefer to go by car, because the memory of the accident is still vivid in their minds, without considering though that statistics show that accidents in cars are way more frequent. This is also due to the extensive media coverage that boosts fear and the perception of risk (Ricciardi, 2008).

Framing.

Framing is another element that is important to present because it influences the perception of risk of investors. Different final decisions may be taken if the problem/investment/issue is presented in different ways. Within the decision making process, framing effects are given by the context in which the decision is taken and the way in which the question is worded and framed (Kahneman and Tversky (1979). The structure of the way a question is presented may indeed generate different results.

An outright example and application of the framing effects is provided with the two following questions:

- Would you invest all your money in a new business if you had a 50% chance of succeeding brilliantly?

- Would you invest all your money in a new business if you had a 50% chance of failing miserably?

These two questions present the same probabilities of event but the framing effect is very evident as question A is more appealing because it soothes the probability of risk and investors perceive risk less from the way it

is formulated. An average investor will not try to reformulate the questions offered in a more comparable or balanced manner according to Piatelli-Palmarini (1994) thus demonstrating a sort of laziness.

In conclusion, as many academic studies have shown (Slovic, Fishhof and Lichtenstein, 1982), light differences in the way risk is illustrated can have considerable effects on how they are perceived.

Hot hand effect – misconception of chance.

A simple exercise to illustrate this concept is to ask people which of the following sequences is more likely to occur when throwing a coin: TTTTTT or THTHHT? The great majority of people will answer with the second. This happens because people have the tendency to see trends everywhere and therefore the first sequence of tosses is perceived as less likely and not as a mere process of probability which it is. While the events are both equally probable because each coin flip is an independent event, disjointed from the others and in fact the likelihood of a fair coin turning up heads is always 50%. It is just a misinterpretation of probability that leads to this kind of thinking.

People have strong intuitions about random sampling, but most of the time these are wrong.

As in the exercise of generating a random sequence of hypothetical tosses of a fair coin, random sampling in individual's minds is never completely random, people always unconsciously try to even out and balance things, there is a sort of aggregation of small series. When asked to generate a random sequence, most of the people include a portion of heads that is close to 50%. This happens because, as mentioned above, there is the tendency to even out probabilities.

The so called "hot hand effect" is the wrong belief according to which a person who has experienced a success with a random event has a greater chance to succeed in the next trial and additional ones. The concept has been applied to many fields, including sports. The fact that a basketball player has signed a point, does not imply that he or she is more likely than other players to sign again.

In finance this happens as well with investments. Investor elaborate information in a wrong way when they consider past returns to make expectations of future returns.

Boiled frog effect: change blindness.

This effect deals with the detection of changes.

Generally speaking, people are not good at spotting changes, this phenomenon is even more noticeable and important if changes occur gradually (Simons & Rensink, 2005).

A simple translation into the economic world of this effect can easily be provided with the following example by Bazerman and Moore (2009). An accountant coping with the auditing of a large well-respected company approves the financial statement of the company yearly. Year after year, the company starts to stretch the law under a few occasions, but commits to no unethical behaviour. The year after the company stretches the borders a little further and the decisions violate some accounting standards, but the financial

statements are approved nevertheless. By the next year, the company is even breaking some laws. As an accountant would you notice the changes gradually? At which point would you refuse to accept the records? Bazerman and Moore (2009) continue suggesting that it would be much easier to detect the changes if they occurred abruptly from one year to the next. This unfortunately is a widely used practice, in any sector of business, politics, public administration etc.

In fact, when people's behavior becomes unethical one step at a time, individuals are less likely to notice what is happening and more likely to be able to justify the behavior than if ethical standards were abruptly abandoned (Tenbrunsel & Messick, 2004).

The effect of "ethic dropping" is called boiled frog effect because of popular wisdom saying that if a frog is thrown into boiling water it will immediately jump out. However, if the frog is put in nice warm water and gradually raising temperature, by the time the frog realizes the water has become too hot, it will already be cooked (Bazerman and Moore 2009).

1.7.3 Prospect Theory.

Formulated by Daniel Kahneman and Amos Tversky in 1979, Prospect Theory explains the process of **making decisions involving uncertainty** in the context of psychology and economics. It provides an insight into why people choose to take also non-optimizing decisions, giving up that strict rationality typical of classical economic theories according to which individuals should make only utility maximizing choices. It is indeed a fundamental part of behavioural finance and it is often put in contrast with the more traditional Efficient Market Hypothesis and Expected Utility Theory. According to Olsen (1997), prospect theory gives weight to the cognitive limitations of human decision makers.

Prospect theory assumes that people are not always rational decision makers and this is obviously in contrast with standard finance and classical decision making theories, in fact, according to this new theory, people make decisions and are bounded to several behavioural biases.

It emphasises that an individual decision iter under uncertainty is characterized by lasting biases affected by both cognitive and emotional processes. As Schwartz (1998) explained, prospect theory makes the assumption an investor will assess outcomes in terms of gains or losses in relation to a specific reference point instead of the final value within their overall investment portfolio. Again the issue of anchoring is a fundamental point in the understanding of these theories and related investors' behaviours.

Human beings behaviour provides consistent evidence against the more strict theories of classical finance: the assumptions of self-control do not hold for these investors, in fact, according to prospect theory emotions do not allow for rational decision making. Furthermore, Bernstein (1997) underlines how people widely diffused inability to fully understand the issues they are dealing with. Investors are humans and, as such, overconfident and loss averse.

Indeed, Kahneman and Tversky studies are based on the notion that individuals are loss averse, that is they are more concerned with losses than they are with gains.

Prospect Theory has two stages:

- the editing stage, in which risky situations are simplified using various heuristics of choice;

- the evaluation stage, in which risky alternatives are evaluated through the use of some psychological principles to understand their likelihood of occurrence.

Among the fundamental principles of Prospect Theory are first of all the loss aversion according to which individuals weight losses more than equivalent gains (further insight into the value function will be provided in the next section); secondly, there is the reference dependence, for which each decision maker has a reference point to which all results are compared, a sort of benchmark to define gains and losses; then there is the diminishing sensitivity to gains and losses, that cause a fall in the effect on utility as the size of the gains and losses are increased in absolute value. Last but not least, the non-linear probability weighting, according to which individuals overweigh small probabilities and underweight large one.

The following table summarizes the main differences between classical utility theory and prospect theory according to their most important assumptions and a summary on the arguments supporting or opposing to them.

Table 1.11: Comparison between the two theories

Classical Utility theory	Prospect Theory
Individual are rational wealth maximizers.	People often act irrationally.
Risk preferences are capture by the shape of the utility function: risk averse if concave, risk lover if convex.	People can be both risk-averse and risk-seeking respectively, not necessarily universally risk averse.
People choose the option that maximizes their expected utility.	Decision making is strongly affected by the way options are presented and framed.
Invariance assumption: the way choices are presented does not affect decision making process as individuals are rational.	Losses weight more than gains.

Source: student elaboration

Secondly, in the table below are summarized the main critics moved to each of the two theories and approaches.

Table 1.12: Critics to the two approaches

Arguments against standard finance	Arguments against behavioural finance
The rationality assumed by this theory implies excessive capabilities of calculation for the average investor.	Behavioural biases such as cognitive limitations, heuristics are not scientific and difficult to analyse.
Judgments are hypothesized to be quantitative and objective.	The decision making process uses factors that are highly subjective and qualitative in nature.
Financial data and surveys do not support the assumptions of rational choice.	Experiments in laboratories are not the same as real life: they provide specific settings and induce certain behaviours.

Source: student elaboration

1.7.4 System 1 and System 2 thinking.

Before proceeding to risk attitudes, this paragraph aims at supporting the behavioural economic and prospect theories by providing a little insight into how our brain works when it comes to decision making.

Rational thinking is a strong assumption because most of the time people do not think rationally.

In a rational world, the decision making process would be as follows:

1. Definition of the problem;
2. Identification of the criteria;
3. Weight of the criteria according to the preferences;
4. Generation of alternatives;
5. Rating of each alternative and each solution;
6. Computation of the optimal decision.

This is one of many models of decision, but it assumes complete rationality to put it into practice.

However, our brain is made of two distinct systems and Stanovich and West (2000) provide a clear division of the two cognitive areas.

System 1 thinking refers to our intuitive system, which is typically fast, automatic, effortless, implicit, and emotional. We make most decisions in life using System 1 thinking. For instance, we usually decide how to interpret verbal language or visual information automatically and unconsciously. By contrast, System 2 refers to reasoning that is slower, conscious, effortful, explicit, and logical (Kahneman, 2003).

On the one hand, we use the fast one for impulsive thinking, it is intuitive and automatic, therefore we only become conscious of what has really happened afterwards, most decisions are made using this one. Especially when we decide under time pressure, system 1 governs us.

On the other hand, system 2 is the system of rationality, of analysis and it requires more time to provide results (decisions).

Investors, like managers, often find themselves in situations that require prompt decisions and this suggests that due to managers' frantic and hectic pace of life, many decisions are taken under the control of system 1, emotion driven. When there is too much information, when the situation is very busy and when too many things are on our mind, system 1 takes action.

This is of ulterior evidence to the fact that the assumption of strict rationality is at times excessive in standard economic theories.

The table below shows a summary and a confrontation of the main characteristics of the two systems.

Table 1.13: System 1 vs System 2

System 1	System 2
Unconscious reasoning	Conscious reasoning
Implicit	Explicit
Automatic	Controlled
Low effort required	Requires high effort
Large capacity	Small capacity
Rapid	Slow
Associative	Rule based
Contextualized	Abstract
Domain specific	Domain general
Nonverbal	Linked to language
Includes recognition, perception, orientation	Includes rule following, comparisons and careful

	weighting of options
Independent of working memory	Limited by working memory capacity
Non-logical	Logical

Source: Bazerman, 2009 and student elaboration.

1.8 Risk attitudes.

Whenever dealing with investors it is vital to understand risk attitudes and their implications. As previously said, a first fundamental aspect to be considered is that individuals react differently to gains and losses (Kahneman and Tversky, 1979). The value function that evaluates outcomes is concave in the domain of gains and convex in the domain of losses. This implies that individuals are risk averse in the domain of gains and risk loving in the domain of losses. Kahneman and Tversky (1992) have proved that losses are psychologically twice as strong as gains, indeed it is better not to lose a certain amount of money rather than gaining it on a perception basis.

Table 1.14: Attitudes in the domain of Gains vs Losses – value function
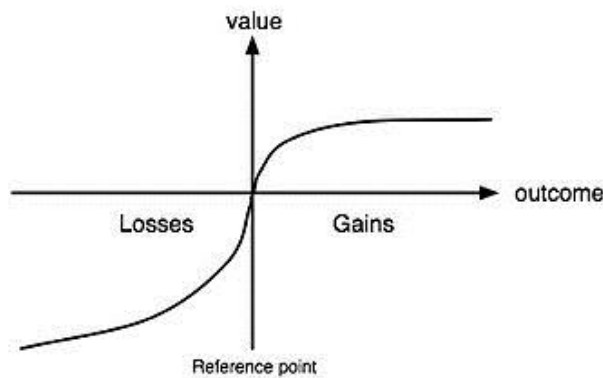
Source: Bazerman, 2009.

In the graph above it is important to highlight that gains and losses are not symmetric: the value function is steeper for losses, suggesting that losses outweigh gains. On the left side of the graph (losses domain) individuals are risk loving, while on the right side of the graph (gains domain) individuals are risk averse. Convexity implies risk seeking, based on the belief that "there is nothing to lose".

The reference point is the point according to which each individual bases his/her decisions and it will be shown how decisions about investments can change according to how things are framed and presented, in fact, contextualization often makes people change their reference point, sometimes abandoning rationality and utility maximization.

In their research about decision making Duchon et al (1991) indeed state that decision makers evaluate negative and positive outcomes differently. Their response to losses is more extreme than their response to gains which suggests, psychologically, the displeasure of a loss is greater than the pleasure of gaining the same amount. Consequently, decision makers are inclined to take risks in the face of sure losses, and not take risks in the face of sure gains.

Managerial risk taking propensities vary depending on individuals (having a background of incentives and experience) and contexts. Some people are more risk averse than others and it mostly depends on their personality. But the general feeling according to Shapira research (1987) is that if a manager fails to take risks he/she should avoid being in the business of managing as risk taking is a fundamental part of this job. Same applies to markets and investors as among managers' duties is certainly that of making investing decisions.

Negative attitude toward risk.

Some managers encourage risk taking, especially at high organization levels; others, on the other hand, advise to share the risk responsibilities with other managers without relying everything on a single individual. This is a negative attitude towards risk, a fearful one typical of those managers who see risk as unconnected to uncertainty (which would be the classical theory definition of risk).

In fact, they see risk as being defined in terms of the magnitude of a projected loss or gain rather than that magnitude weighted by its likelihood (Shapira, 1987). In other words, they are interested only in how much the negative result alternative could impact on the organization performance.

There is no room for the classical definition of risk that is uncertainty, these managers consider only the negative impact the alternative could have, without taking into account the probability of its occurrence.

Positive attitude toward risk.

However, according to Shapira (1987) other managers are more willing to take risks for three main reasons that will be hereafter explained.

Firstly, because risk taking is vital to success in decision making, indeed risk and returns are strictly related. Secondly, these positive-attitude-toward-risk managers believe taking risk is a part of their job. It is also interesting to highlight that both MacCrimmon and Wehrung (1986) and Shapira (1987) found out that indeed managers are more risk taking in business decisions rather than in personal decisions.

The third motivation is emotional, because the threat of failure increases the pleasure of success, the more one is risking, the greater the pleasure will be in case of success. The fear of failing enhances the satisfaction that can be gained with success.

These three motivational factors cause greater variation in risk taking as they describe different contextual factors. This is what my thesis aims at investigating, whether exhibiting different risk preferences under different conditions changes decisions.

Factors influencing risk decisions.

According to Shapira (1987), managers compare actual performance/positioning (eg. profit, liquidity, sales) with a target positioning and think it is acceptable to risk if they are afraid of not meeting the performance target they set. Another comparison managers make, in order to understand what the company situation is, is analyzing the current position of the company and the bankrupt danger. If the company is healthy, they are less likely to take risks, whereas if the company is suffering and its position in the market threatened by competitors, they are more likely to take risks in order to improve and avoid bankruptcy. As Lopes (1987) highlights, the value attached to alternatives is differing in risk may depend not only on whether they are framed as gains or losses, but also on which of two targets (success target or survival target) is evoked. This approach of framing the problem is indeed what I want to further analyse in my thesis.

The following chart provides a scheme of the definitions of risk seen so far.

Table 1.15: Risk Definitions.

Theory	Definition
Classical theories	Risk = magnitude of the outcome * its likelihood
Managers/investors	Risk = magnitude of the outcome

Source: student elaboration.

Risk becomes hazard because risk is no longer the variability of an outcome but its expected value. Therefore theories of decision making under risk do not hold anymore as risk is no longer perceived as the whole distribution of possible outcomes and consequent variability, but as the mere expected value of an outcome. There is therefore a sort of managerial/investors insensitivity to probability estimates.

Empirical studying of risk taking have shown that risk preferences vary with context; acceptability of a risky alternative depends on:

- Dangers and opportunities

- Aspirational levels for the decision maker

Indeed, focus can be moved from the dangers involved in one alternative to its opportunities. (Lopes 1987).

Human problem solving is known for evaluating alternatives considering a few key aspects at a time. Therefore it becomes fundamental to consider the order of presentation and agenda effects (Cohen, March and Olsen 1972; Kingdon 1984).

1.9 A new perspective on risk.

Shapira and March (1987) identified three major differences between the definition/perception of risk associated to the classical decision theory and the one provided by the managerial perspective. In their paper they suggested a new way to look at risk, not considering a mere number, but an elaboration of more aspects capturing its whole essence. The table below summarizes the fundamental points.

Table 1.16: Comparison between classical and managerial perspectives on risk.

Classical decision theory	Managerial perspective
Risk of an alternative = the variance of the probability distribution of possible outcomes that might follow the choice of the alternative. So, risk = variance of the distribution. Risky choice = one with a wide range of possible outcomes.	Risk is associated with the negative outcomes of an alternative. Uncertainty about positive outcomes is not treated as an important aspect of risk. More weight is given to negative outcomes, poor results, danger. Risk is not thought in terms of the distribution of all (both positive and negative) possible outcomes, but only associated to the negative ones. So, risk = danger/hazard. Risky choice = one that contains a threat of a very poor outcome.
Risk is a probability concept.	Risk is the possibility of obtaining negative outcomes.
Risk is a number.	Managers do not like to reduce risk to a mere number because it cannot capture all the financial, technical, marketing, production etc. aspects of risk. Risk is a multidimensional phenomenon and therefore cannot be translated into a single number.

Source: student elaboration.

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Managers interviewed in the research (Shapira and March, 1987) affirmed that they would never look at the probability of success or failure but at the volume of risk. In practice, a million dollar gamble is a risk, but a gamble of ten dollars is not a risk. The amount involved is a major cause of concern as the study shows.

1.10 Familiarity and risk.

Expected utility-based portfolio theory is based only on financial attributed of asset and bases its considerations on risk intended as a number, however, there are also non-financial attributes influencing investors behaviour and choices: familiarity is one of these (Benartzi, 2000).

As reported in the previous sections, the phrase diversification reduces risk is an axiom. So far, diversification was intended as having several different stocks in the portfolio, regarding different sectors and services. However, investors should also diversify geographically, because if a crisis occurs in the region they live in, at least their money is invested elsewhere and they do not depend completely on local businesses stocks. However, evidence shows that investors have a strong preference for the familiar and for domestic investments. For instance, it is well known that 16% of Coca Cola stock is held in Georgia, in fact, its headquarters is in Atlanta. A detailed look at the geographic distribution of the shareholders showed that people prefer investing in the familiar rather than in the unfamiliar, often because they feel they know more about local stocks, have more information available. However, if this was true, they should trade much more frequently according to the changing of circumstances and prices; this is not true because evidence shows that the general tendency is that of buying the stock and holding it. Investor aversion to risk should imply a major diversification within their portfolios, however, according to the home country bias, people simply prefer to invest in the familiar, support the local team, buy something they know and can see somehow, thus reducing their portfolio payoff and expected utility as the risk is not completely diversified.

As Huberman (2001) reports in his article Familiarity Breeds Investment, there is a high positive correlation between the savings of a country and its investment rate, highlighting the fact that capital flows do not always go towards most profitable investments but to the most familiar ones. These are very important considerations regarding risk, as they show that risk is a multidimensional complex concept made of many variables to be added to risk perception and returns; investment choices are therefore affected also by familiarity. Not only does this concept apply to stocks, but also to real investments. About 20-30% of workers retirement savings are reinvested in the company's stock (Benartzi, 2000). A certain amount of these investors might be motivated by the company's incentives to reinvest in its stock as they want it to be successful, but many are fostered by the familiarity they feel for the company, they like holding the stock because they know it well. As a further confirmation, Macías (2015) showed through an experiment that investment in a famous (thus better known and more familiar) brand is higher than in a non-famous brand by measuring perceived risk and investment intention for two different brands.

Another familiarity implication comes from the marketing world: it is well known that Coke and Pepsi are two giants firm competing in the soft drink market; in the US, a great weight is based on the competition for gaining access to schools' distributors: this is a fact strictly correlated to familiarity because once students start drinking one of the two, they are likely to prefer it for their whole life because they are familiar with it.

Furthermore, retiring workers prefer to invest their money in their company's stock rather than on a simple domestic stock because they feel it is safer (Benartzi, 2000) and that they have more information about it. It is important to highlight the use of the word "feel" in the previous sentence because, in fact, investors think they possess information that is not available to the market yet due to their "being part of the company", it is a clear illusion of having more information than what the market has. Being more informed implies no only buying stock but also knowing when to sell them, and Benartzi (2000) showed that this is not always true as portfolios are rather static even for familiar investors. The home bias represents the optimism of people and wishful thinking for what they feel more connected to – be it for brand familiarity, geographic proximity or for being an old employee of the company – and not necessarily the fact that people may possess additional information about the stock.

Familiarity also leads to wrong expectations: people are more familiar and therefore feel more competent, this results in an increase of the expected value of the returns distributions and in a lower variance. The lower variance is due to the fact that familiarity implies more safety, solid stocks in the mind of the investor and, therefore, less fluctuations of prices and returns.

In financial markets there is information asymmetry, because the issuer and the investor have a different degree of knowledge about investments, in fact, not all individuals have the same level of information.
This results in familiarity issues being connected, because individuals prefer brand investments as they have a reputation that can somehow be trusted by them (Akerlof, 1970).
Indeed, the value of the brand/firm and related stock is positively correlated to investors' preferences. This fact is also known as consumer based brand equity and it is composed by four aspects according to Aaker (1991): awareness, associations, perceived quality and loyalty that will be further in sighted in the next paragraph.

1.10.1 Awareness, associations, perceived quality and loyalty.
First of all, awareness is the quality according to which an investor/consumer is able to identify and recognize the brand in many contests, allowing a strong memory of it.

Associations is how the brand is memorized in the consumers/investors' minds, what feelings it is related to, the attributes connected to it and previous experiences.

Perceived quality is defined as a factor offering advantages against other competitors (Aaker, 1991) because it creates a preference and has a positive impact which is then transformed into loyalty.

Last but not least, loyalty is an emotional link between the brand and the investor. Loyalty prevents the individual from changing brand and related considerations, acting as a barrier to competing brands (Aaker, 1991). It is a tendency to choose the brand as the main option in any purchasing and investment situation (Too and Donthu, 2001).

Financial markets appreciate and reward all those stocks and companies disclosing more information than others and as explained previously explained, so do investor when making decisions under uncertainty.

This is the major reason why firms have a growing interest in valuing their brands and disclosing more information in order to be as transparent as possible, thus attracting more investors and influencing the valuation of firm stocks in the capital market (Himme and Fisher, 2014).

Therefore, the perception of the brand investors have plays a fundamental role in making investing decisions under uncertainty, once again because people prefer what is familiar to them, what they deeply know or think they know. Indeed, positive attitude towards the stock and affinity with the company (Aspara and Tikkanen, 2011) positively affect and influence investing decisions.

Hereafter is a table summarizing recent literature about brand equity and investment decisions.

Table 1.17: Studies on brand equity and investment decisions.

Authors	Independent variables	Dependent variables	Results
Aspara, J., 2011	Factors: product design Covariates: product design evaluation, personal relevance of the dominant firms' product	Investment interest	Product design and personal relevance have significant effects on investment interest. Furthermore, results suggest that product design evaluation increased expectations of financial returns for the firm.
Aspara, J. and Tikkanen, H., 2011	Predictors: positive attitude towards the firm, affective self-affinity with the firm. Control: familiarity with the firm.	Extra motivation to invest in the firm stocks.	Affect (affective self-affinity towards the company) provides an extra motivation to invest in firm stocks, beyond the expected financial returns.
Aspara, J. and Tikkanen,	Predictors: personal	Investment intention when	Investment intention is

| 2010 | relevance of firm's main product category (involvement), affective evaluation of the brand.

Control: brand familiarity. | financial return is equal to a comparable firm, investment intention when financial return is lower. | positively affected by:

-affective evaluation of the brand;

-personal relevance of firm's main product. |

As the table shows, familiarity is an important factor in investing decisions not to undervalue as it influences the perception of risk when making decisions.

1.11 Ambiguity aversion and risk.

As reported in the previous paragraph, risk is also influenced by familiarity and the - at times only perceived - superior knowledge investors believe to have. If there is no knowledge, another issue arises: ambiguity aversion. Ambiguity aversion is generated by a comparison with indeed more knowledgeable people or with less ambiguous events. Whenever comparison arouses, ambiguity aversion steps in; Tversky (1995) provided evidence showing that ambiguity aversion is stronger in comparative contexts in which individuals can make comparisons with other people or other situations, while the phenomenon disappears if the situation is presented without any other possible confrontation. Isolation allows therefore to eliminate ambiguity aversion in decisions under uncertainty.

Ellsberg (1961) proved through several studies that indeed people prefer to bet and invest on the known probabilities. The Ellsberg paradox is a violation of classical expected utility theory because people prefer to gamble when they know the probabilities rather than when they do not: they are ambiguity averse.

Hereafter is reported one of the most clear and direct examples of this, known as the "two-colour" problem (Viscusi, 1999).

Consider two urns containing 100 balls each, of which one contains 50 reds and 50 blacks, while the other 100 balls with an unknown proportion of black and red balls.

| **Urn 1** 50 red balls 50 black balls | **Urn 2** 100 among red and black balls |
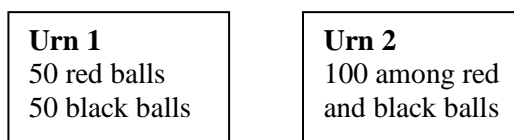
The individual is asked to choose from which urn to draw a ball and depending on the outcome he/she might get 100$. Most individuals feel indifferent between choosing a red or a black ball in either urn, but most of them would rather draw from the first urn where proportions are indicated. This is a clear example of the importance of ambiguity and vagueness when it comes to choices under uncertainty and has important implications for investments issues. This result implies inconsistency with the usual preferences indicated by

expected utility theory, because it basically states that the probabilities of black and of red balls are bigger in urn 1 than in urn 2, and this cannot sum to one for both urns: it is a paradox. It follows that decision under uncertainty is highly related to ambiguity and familiarity, as reported previously in the paragraph. Ellsberg (1961) defined ambiguity as a quality depending on the amount, type and unanimity of information, giving rise to one's degree of confidence in an estimate of relative likelihoods. It is a proof against the effectiveness and trustworthiness of the expected utility theory, as showed by the simple experiment. Heath and Tversky (1991) further investigated the issue to verify whether it was confined to chance situations or whether it was applicable to all domains of decision making, such as investment decisions, legal decisions, health decisions as long as there is room for uncertainty. Heath and Tversky (1991) found out empirically through many studies that people have the tendency to rely on their vague beliefs in all those contests in which they feel knowledgeable, whereas they tend to rely on chance when they have no competence about the situation. Again, this is also linked to familiarity, people rely on what they are familiar with, on what they feel is close to them. It is important to understand that ambiguity aversion is caused by a sense of incompetence, people feel little confident when they are not competent and this situation is created when there is somebody better than them or when they are in a situation in which they know they are not good at. This however is true in a context in which the individual is asked to evaluate an event or an investment in a world with many other options to compare it to; whereas, if the decision is to be made in isolation, individuals are more likely to reason and follow the likelihood of each event, in a more rational way. This is called comparative ignorance hypothesis. It is possible to manipulate somehow decisions by providing similar comparisons to the decision maker (Ellsberg, 1961). Choices between alternatives therefore depend on the degree of uncertainty (that otherwise generates ambiguity aversion) and on the source of uncertainty. Ellsberg studies have underlined that on one side comparative evaluation allows the investor to make a decision knowing the degree of ambiguity and the level of knowledge possessed involved, while, in a non-comparative setting, a decision maker does not discount his/her level of ignorance. On the other hand, although making a more rational decision in a non-comparative setting, in a comparative setting an individual shouldn't be intimidated by other people having more knowledge. These are two different possible interpretations of these behaviours according to Ellsberg (1961).

Comparative ignorance has implications for the financial markets in the sense that an investor with competence in sector A might show ambiguity aversion if asked to choose between an investment in A and one in B (in which he is not competent nor knowledgeable). However, if the two investments were presented separately and evaluated independently the investor would not show aversion. Another important implication of these studies is that the order in which investments are presented is fundamental as if the less familiar one is presented first, it might be given more value than it would if it were to be presented after the more familiar one.

Chapter 2: Multidimensional Risk Survey

This second chapter is structured in three main parts. The first one deals with the concept of multidimensional risk and provides an analysis of the issue. The second part, explains the objectives of my survey and the expected results, while the third and last part illustrates how the survey was conducted, the tools used and how the questionnaire was set up.

2.1 Multidimensional Risk.

As extensively explained buy Shapira (1987), risk is not a mere number in the mind of investors. It is a much more complex concept, made of many elements that change of importance depending on each person's background and previous experiences.

Multidimensional risk involves both economic factors such as financial ratios considerations, classical variables such as the beta coefficient or the variance and other aspects that are typical features in behavioural finance and economics such as familiarity with the brand of the stock, geographic proximity, loss aversion, anchoring, the role of feelings and affect, framing etc.

The phrase "perceived risk" often emerges when talking about multidimensional risk as it is the subjective decision making process that individuals employ regarding the assessment of risk and the degree of uncertainty (Ricciardi, 2008).

Behavioural finance revealed that many cognitive and emotional characteristics can be applied to understand how investors and decision makers perceive risks related to financial products (Olsen, 2001).

Within this framework of concepts, it is important to understand what perceived risk: it is the risk that a consumer believes there is in the purchase of financial services and assets, whether the risk actually exists or not (Ricciardi, 2008). According to Cox and Rich (1964), perceived risk is essentially a function of consequences and uncertainty (the person's feeling of subjective uncertainty that he or she could "gain" or "lose" from the transaction). Previous studies by Tarpey and Peter (1975), developed six components or dimensions of perceived risk, including: financial, product performance, social, psychological, physical, and time/convenience loss. As it can be seen, multidimensional risk is a combination of behavioural and traditional financial aspects. Another study by Renn (1990), identified that perceived risk is a function of the following elements: intuitive heuristics (anchoring, overconfidence, availability etc.); perceived average losses over time; situational characteristics of the risk or the consequences of the risk event; associations with the sources of the risk; credibility and trust in risk-handling institutions and agencies; media coverage (social amplification of risk-related information); judgment of others (reference groups/family members); personal experiences with risk (familiarity). These factors will be included, among others, in the multidimensional risk survey, focusing however more on the attributes of multidimensional risk.

Multidimensional risk is important because the judgment of risk is not unaffected by previous experiences, people's opinions etc., but rather it is connected by many attributes and factors that investor consider when

making an investment decision under uncertainty. To understand how investors process information about risk, it is important to understand what belongs to their concept of risk and how they perceive it. Academic literature (Garner et al., 1956; Schiffman, 1976; Bartley, 1980) has provided many inputs for these researches, in particular when dealing with multidimensional risk and perception it is important to take into account that the individuals perception of risk is – as previously highlighted – based on their past experiences. Moreover, people focus on more than one component to understand risk and human beings have a tendency to organize information in a way in which it makes sense, thus people tend to match the knowledge they have of something to explain new stimuli: there is a tendency to complete information. Furthermore, studies highlighted how individuals' behaviour is based on their perception of what reality is, not necessarily on what reality actually is. That is to say that a measure of risk such as the variance of the distribution may not be completely taken in by everybody, as it is well-known that many people only have a losses based perception of risk, as highlighted by Shapira and others (1987). This will be studied extensively throughout the survey. Last but not least, it is important to bear in mind that perception is an active part of the decision making process and consequently there might be even opposed views of the same event.

According to Olsen (1997), risk belongs to a class of phenomena referred to as emergent. It is an emergent phenomenon in the sense that it has unique, measurable dimensions that only arise out of the specific and unique complexity of a particular situation. Risk must be associated to what it recalls in the minds of investors.

2.2 Analysis Objectives.

This thesis aims at analysing investment multidimensional risk, its components, the way risk is perceived by investors and how these attributes are related with each other.

First of all it must be said that to fully understand the judgmental process of investors, researchers must consider both the cognitive and the affective aspects of how investors process information and perceive risk for a given situation. The goal is to investigate the aspects that are relevant for investors when they deal with risky decisions and in particular what comes to their mind when they think of investment risk. This is vital because within the decision making process, perceived risk is more important than actual risk as it is the real driver behind investors' decisions. Sitkin and Weingart (1995) define risk perception as (1) an individual's assessment of how risky a situation is in terms of probabilistic estimates of the degree of situational uncertainty, (2) how controllable that uncertainty is and (3) the degree of confidence in those estimates.

Another point of interest of this survey is that it aims at providing evidence that investors are not all rational decision makers and that in their decision making processes they are influenced by a wide arrange of elements and figures that are not necessarily traditional financial concepts.

Understanding investment patterns and financial decision making has always been of great interest to researches and financial service providers. These decisions are influenced by demographic variables and risk tolerance (Chavali, 2016). The goal is indeed to collect and provide an analysis of the demographics and

financial literacy scores, understanding how all these variables are related to the attributes and composition of risk. Another goal of the survey is to present a categorization of the respondents of the survey according to the characteristics that emerge from their answers.

Risk may be a clear and neat concept in academic finance, but in fact, in the mind of investors it is a much more complicated issue to deal with. Decision making under uncertainty in these cases is often driven by non-rational thoughts driven by heuristics and other cognitive biases. The goal of this survey is indeed that of investigate the relations between all of these components with aspects like demographics and financial literacy of respondents.

Understanding multidimensional risk and perceived risk is essential in finance as there are various factors that influence a person's risk perception and this phenomenon often has more significance than actual risk within the decision making process of investors. For this reason a measure of risk such as the beta coefficient or the variance is not enough to understand investors' choices, it is vital to go beyond the mere academic financial definition of risk and understand its attributes and relative categories that an investor creates before deciding. Individuals often misperceive the risk linked to a certain financial asset because they lack certain information. Without accurate information or with misinformation, people could make an incorrect judgment or decision (Ricciardi, 2008). For these reasons, a measure of risk such as beta is not enough to capture all these issues, a statistical probability distribution is not enough to explain the perception of risk and multidimensional risk is a prefect description of risk as it combines both elements of behavioural finance (such as heuristics or mental shortcuts) and elements of traditional finance such as the variance of a distribution. Perceived risk is a multidimensional factor by nature, its composition is different with every person because each person gives different weights to its components according to their level of knowledge (their financial literacy level), their demographic characteristics, their character and so on and so forth. Risk is a multi-attribute concept for each individual because what is perceived by a person as a major risk, may be perceived by another as a minor risk. It is a mixture of instinctive and complex decision making, personal knowledge and acquired information from the outside environment.

The objective of this thesis is indeed to see how all these factors combined in the concept of multidimensional risk relate with other dimensions and features of the respondents of the multidimensional risk survey. Particular attention is to be given to the attributes of risk, and to the elements that individual investors recall when they think if investment risk. Among the main goals is to understand whether individual characteristics influence risk attribute importance.

2.3 Questionnaire design and tools.

The complete questionnaire can be found in Appendix A, nevertheless, in this paragraph a synthesis of its structure and of the tools implemented is provided.

First of all, the questionnaire was developed in English as the target respondents were from the US. All the questions were assigned the "force response" instrument in Qualtrics, in order to avoid missing data and prevent lazy workers from taking the survey.

The survey was structured by 30 questions divided as follows in eight sections:

1. Introduction and terms of agreement.
2. Understanding the task.
3. Risk Task.
4. Payoff.
5. Education.
6. Financial Literacy.
7. Investment Risk Attributes.
8. About you.

1. The first part was an essential presentation of the questionnaire and its rules. In this section Amazon Mechanical Turk workers (hereafter, Amazon Mturk Workers or simply Workers) could find all the details and directives to properly fulfil the questionnaire, together with the payment schedule and the possible bonus. They also found the clause according to which they would be thrown out of the survey if found cheating or not paying enough attention to the tasks. These checks could be made through control questions and through the tools of Qualtrics: the survey flow was set in a way to block the people who did not match the required level of attention needed for quality data collection. Another important aspect which was explained in this first section was the fact that throughout the questionnaire there was no back button, i.e. there was not the possibility to go back to a previous page and change the answer submitted. Please refer to Appendix A for further details about the conditions.

2. The second part was indeed a check question. This question was very useful because it allowed a first control on the workers' attention. In addition, it was a good way to make people deeply understand the next task that required a certain focus when reading it: the control question was at the base of the risk task coming right afterwards. There were two chances of getting the question right: if the right answer was not selected at the first attempt, the person would have been presented with the same question again, but this time remarking the fact that if they were not focusing in the fulfilment of the questionnaire they would be thrown out of the survey without being paid. In fact, although very clear and direct, 9 workers in total were blocked after not matching the right criteria.

The question aimed at simply helping workers to understand the dynamics of the risk task and it was formulated as follows:

URN A: if a WHITE ball is drawn you earn 6 points. If a BLACK ball is drawn you earn 4 points.
URN B: if a WHITE ball is drawn you earn 10 points. If a BLACK ball is drawn you earn 0 points.

In case the ball drawn is "WHITE" and you chose the "URN A": what is your payoff?

3. The third part was the Risk Task. This task was taken from decision sheet B of Chakravarty and Roy (2009). As it was a mentally demanding task, requiring a certain degree of attention, it was decided to place it at the beginning of the questionnaire, leaving tedious demographic questions at the end of the survey. Indeed this proved to be a strategic decision in term of results as it will be seen in the next chapter, because the expected trend was clearly observable in the data collected. An extensive analysis of this question is provided in chapter 3 and the complete task text can be found in Appendix A.

   In this task, respondents were presented with a decision table with 10 situations each having the possibility to choose between drawing a ball from a low-risk urn (Urn A) or drawing a ball from a high-risk urn (Urn B). One situation after the other, the low-risk urn remains identical while the expected payoff of the high-risk urn increases monotonically. The point at which subjects switch from the low-risk urn to the high-risk urn reveals information on each respondent risk preferences. Indeed as the probability of winning a prize in the more risky urn increases, the urn becomes more and more attractive.

4. Payoff. This section was strategically included in the middle of the questionnaire in order to give the workers a further positive stimulus to proper fulfil the survey. It was the section providing the economic results of the risk task, that is the bonus payoff that each respondent was granted according to their choices. The maximum bonus achievable was of $1 and it all depended on the urn that they had chosen in each situation. Through the tools of Qualtrics a random number was generated by the website (on purpose a number between 1 and 10) and the corresponding situation was chosen. According to the worker preference in terms of urn for that specific situation and the ball drawn (created with a set of embedded data in Qualtrics), the bonus was assigned.

5. This section dealt with respondents' education. The goal was to identify the background of the Workers, whether they are working, studying or unemployed looking for a job, what levels they have achieved in their studies and most importantly whether their studies are related to a financial/business/economic field. Correlated to this last question was another concerning the current job sector, in order to see if they are likely to be involved in financial issues and if they actually work using economic concepts.

   Another important aspect in sighted in this section was the reliability and regularity of the workers' salaries.

Table 2.1: Question on income, preview.
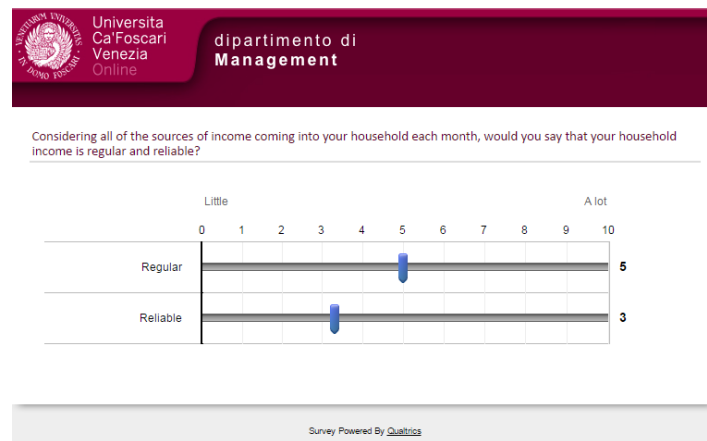
Source: student elaboration.

6. Financial Literacy of the workers was a key part of the survey and it was presented in the questionnaire under the name of financial part. It is vital as it provided understanding of the levels of financial knowledge of the respondents, allowing the knowledge of people not working in financial environments or not having a financial background to emerge. To measure the financial literacy score, this section submitted 8 questions to the workers about fundamental financial concepts. Each worker was asked to respond and the proportion of correct answers reflected the financial literacy level of the respondent. The first two questions asked whether the worker knew/used any elements of a list made of financial products ranging from the most common credit cards to the more peculiar microfinance loans etc. there was the possibility to select more than a product and this allowed the computation of the score for this question.

Another question was related to the way of saving of investors, to investigate whether they do save and, if so, how they do it and where they store their money. In this question as well there were both everyday way of savings such as the simplest "I save money in my wallet" or "I give money to some other family member to save on my behalf" which implies a low financial literacy, to the more disciplined and systematic "paying money in a savings account".

The following five questions dealt with gradually more specific and direct financial related topics such as: interest rates, risk-reward ratio, portfolio diversification, differences between stocks and bonds, relation between different assets, returns and time horizon.

As some of these questions are very popular in financial literacy measures and in online surveys, to prevent the workers from searching the answer in Google, the question/answers/numbers involved were slightly changed to avoid this bias in the data results. A fundamental basis for this section was the OECD-INFE International Survey of Adult Financial Literacy Competencies.

Furthermore, a control question was included, specifically asking participants to select a certain answer among the ones available.

7. This section was dedicated to the components of multidimensional risk, the core part of this thesis. It included two parts: an open question and a ranking one on multidimensional risk and one on diversification. To prevent the anchoring effect, the open question was submitted before the question in which respondents were asked to rank the components of risk, so that they could freely express what risk in investment really meant to them.

The open question was formulated as follows:

Q19. Could you please list the things that come to your mind when you think about investment risk starting from the most important for you? Feel free to write as much or as little as you wish. Write "finished" at the end of your answer.

As it can be seen, there was a control part in this question too. It was added in order to check participants' attention through an action, i.e. asking them to write finish at the end of their answer.

The question was aimed at finding the components, adjectives, relations that investor use when making an investment decision under uncertainty. A question to get an insight into what risk actually means to people investing. In order to avoid anchoring and other biases, this open question was presented before the ranking question (please see Appendix questions Q19 and Q20 for details). This was done to have more natural, spontaneous answers. Furthermore, as previously explained, in the questionnaire it was not possible to "go back" and all questions were made compulsory in order to have more complete data to analyse.
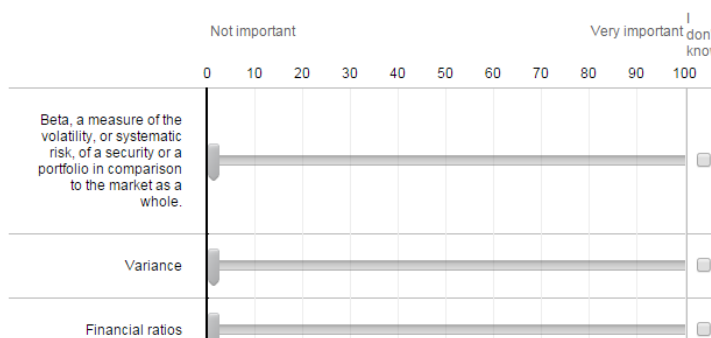
The other question dealt with a series of aspects that investors are likely to consider when making investment decisions and asked them to rank the elements from the most important to the least important. This could be done with some specific tools in Qualtrics.

Table 2.2: Question 20 in Qualtrics, part of the ranking.

Source: student elaboration.

8. Finally, the "About You" section was left at the end of the survey on purpose, as Bickman and Rog (1997) suggest in order to let respondents focus most on the important and more demanding parts of the questionnaire. Standard demographic questions were asked in this part.

2.3.1 Qualtrics.

Qualtrics was a very interesting and useful tool to develop the questionnaire. It required some initial learning as a whole new world opens up when dealing with the creation of online questionnaires with it.

Through the Survey Flow tool it was possible to view and edit all the elements of the questionnaire, to organize the presentation of blocks and branches as wished, not to mention the end of survey elements to set up complex logic and functions. The end of survey was useful at the very beginning when the respondents who did not perform well in the check questions were directed to the end of the questionnaire and, finally, out of the survey thanks to the Skip Logic tool of Qualtrics.

Furthermore, the software math operations code was used to perform math operations in the survey, in particular to compute the payoffs of the risk task and to display afterwards the output to the respondent.

Another important aspect was assigning each worker an MTurkCode, through the random number generator of the Web Service, in order to prevent workers from repeating the task more than once. Indeed, once the batch was completed in Amazon Mechanical Turk, each worker was assigned a qualification before being paid. The Randomizer was used to choose randomly a ball (white or black) in the risk task of the questionnaire and to select a random situation to proceed with the bonus. The block of the risk task was the most complicated one to organize, as it required many steps as the image below partially shows.

Table 2.3: Part of the Survey Flow and Maths Operations.

Source: student elaboration.

The risk task was organize as hereafter explained. First of all, through the Web Service a random number was generated to draw one of the 10 situations included in the risk task (please refer to Appendix A, Question 4 for the complete text of the task). After that, in the block of the risk task the randomizer would

draw one of the two "balls", either black or white. Afterwards, the "Then Branch If" were employed to create the sequence of all the 10 different situations of the task. For each of these, two other "Then Branch If" were created in order to create the two possibilities: the case in which the respondent selected Urn A and the one in which he/she selected Urn B. For each of these branches the correspondent payoff, i.e. the bonus, was then calculated (see picture below) according to the terms of the risk task.

Table 2.4: Computation of the payoff.

Source: student elaboration.

2.3.2 Amazon Mechanical Turk.

As previously reported, the questionnaire was made using Qualtrics for the collection of the data and to keep track of workers (the people filling the survey), however, it was run with the help of Amazon Mechanical Turk used to recruit and pay the workers.

An excellent source of experimental data and labour force, the website is in brief a real market place. In this section this useful source of experimental data will be illustrated and the major concerns about it will be analysed and addressed thanks to the considerable literature dealing with the topic.

First of all, it is essential to say that this tool brings advantages to both employers (requesters) and employees (Mturk workers). The first ones can publish HITs (Human Intelligence Task, that is a unit of work in Amazon Mechanical Turk jargon). To provide a definition of it, Amazon Mechanical Turk is a crowdsourcing web service that coordinates the supply and demand of tasks that require human intelligence for the fulfilling (Paolacci et al, 2010).

The requester publishes the task and each worker chooses among the tasks available the one that suits him or her best. As workers, these people are offered a salary, called reward. According to Horton and Chilton (in press) the typical MTurk worker is willing to work for about $1.40 per hour.

The requestor can also select employees according to their demographic characteristics and other specific features needed for the success and precision of the survey. By doing so, only workers that meet these needs are able to see the task posted.

In the case of the Multidimensional Risk survey, the restrictions made were to US located people, in order to have a more homogeneous pool of people answering. There were no restrictions regarding the age as part of the survey aims at seeing how demographic features are related to multidimensional risk components and last but not least, people were obviously allowed to take the survey only once.

The task estimated time to complete the task in more or less 15 minutes according to the trial version launched. The brevity of the survey was a decision taken in order not to make people tired during the fulfilment of the questionnaire and to therefore have more meaningful answers.

The wage is not granted to all workers: this feature is an incentive for the workers to properly perform the task and not underestimate its importance by answering randomly. As reported in the previous paragraph, in the Multidimensional Risk Survey there were 4 questions checking attention and the careful reading abilities of the workers. In fact, 9 of them were thrown out of the survey and therefore were not paid because they did not meet the necessary standards to complete the survey. Good work is also rewarded on the other hand, indeed in this case the bonus was given by the risk task, in which the worker could gain up to $1 in addition.

The average hour age could only apparently lead to the conclusion that only low paid workers in need for some more money complete the surveys. This is easily denied considering that until recently Amazon.com was paying workers with Amazon.com gift cards, while paying cash only to US residents.

Among the motivations that trigger workers to participate in surveys are many reasons:

- Fruitful way to spend their free time and at the same time getting some cash.
- For "primary" income purposes.
- For "secondary" income purposes, as a sort of pocket change.
- To kill time.
- Because the tasks are interesting and fun.
- Because subscribers are part time workers or are currently unemployed.

When asked to select the reasons(s) for completing tasks in Amazon Mechanical Turk and presented with this list of alternatives, US respondents answered as follows according to Ipeirotis's analysis (2010). The options were not mutually exclusive.

Table 2.1: Amazon MTurk workers' motivation.
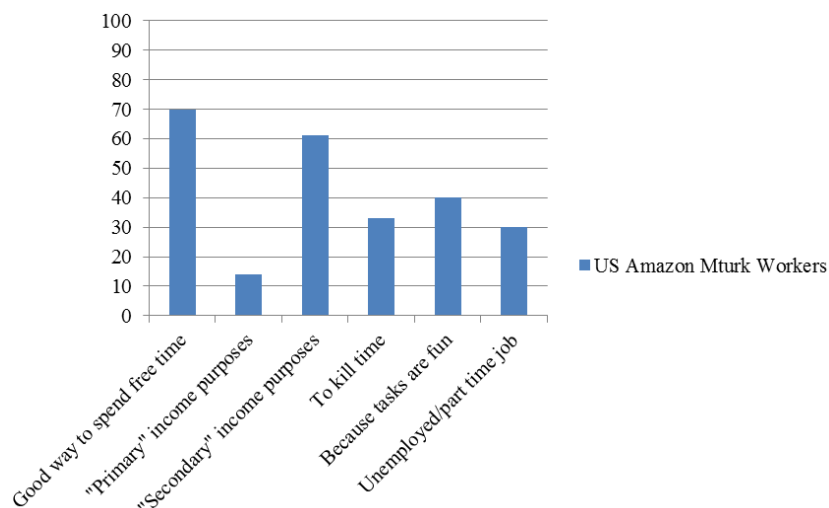
Source: Ipeirotis, 2010 and student elaboration.

The service was started in 2005 and has long been used, studied and validated as a trustworthy system of getting workforce and effective responses (Erikson and Simpsons, 2010).

Among the common concerns surrounding Amazon Mechanical Turk is undeniably the unfamiliarity of many researchers with online labour markets. Uncertainty may come also by the demographic characteristics of the workers possibly affecting the quality of the data collected, but many studies have proven these worries wrong. Much research was addressed to these issues, especially to compare the results of surveys completed with more traditional subject populations and those of Amazon M. Turk workers.

The results were outstanding.

Among the features taken into consideration in these studies were:

- The gender and age of the participants. It was shown that the percentage of women (64.85%) was higher than that of men taking part. The reasons for this may reflect the fact that women have more internet access in general (either at home or at work) or to motivational factors (Paolacci et al, 2010). Notwithstanding this fact can also be said about pools of subjects recruited in more traditional ways (Goslin et al, 2004). In this survey, however, the male participation was higher than that of women, with 60% and 40% of participation, respectively. The reason behind this result can probably be found in the fact that women are generally more risk averse than men (Barsky et al., 1997) and indeed the title of the survey regarding risk might have prevented some from taking it. Again a motivational factor.

  As for the age, Amazon Mturk average workers age is 36 years old, slightly younger than that of US population as a whole. In the Multidimensional Risk Survey the age average was 35.5, in line with the considerations of Paolacci (2010).

- As for education, the educational levels of US citizens recruited via traditional survey methods is generally slightly lower than that of Mturk workers, this feature easily explained by slightly the younger age of its population and from the fact that early adopters of technology are probably characterized by higher education levels. Education will be analysed in this survey with particular attention to the financial literacy of the respondents, further insight will be provided in the next chapter.

To sum up, US workers on Amazon Mechanical Turk are a fair representation of the US population, at times even better than those pools that can be reached through common traditional university subject pools.

To conclude, it is interesting to see a comparison of different recruiting methods hereafter provided in the table.

Table 2.2: Trade-offs of different recruiting methods.

	Laboratory	Traditional web study	Web study with purpose built website	Mechanical Turk
Susceptibility to coverage error	High	Moderate	Moderate	Low
Heterogeneity of samples across labs	Moderate	High	High	Low
Non-response error	Low	High	High	Moderate
Subject Motivation	Moderate / High	Low	Low	Low
Risk of multiple responses by one person	None	Moderate	Moderate	Low
Risk of contaminated subject pool	Moderate	High	Moderate	Low
Risk of dishonest responses	Moderate	Low	Low	Low
Risk of experimenter effects	Low	None	None	None

Source: Paolacci, 2010.

After the representativeness of the subject pool, the second issue that often arouses when mentioning Amazon M Turk is the quality of the data. As mentioned earlier in the chapter, workers are being checked through some tricky or control questions, in order to assure the complete understanding of the tasks and the quality of the data being collected. Instructional manipulation checks identify inattentive subkects and remind them to pay more attention (Oppenheimer et al., 2009).

Chapter 3: Survey Analysis

This third chapter discusses the analysis of the questionnaire and presents the core results. A first descriptive analysis of the sample population and of the results and main trends is provided, including a semantic analysis and a categorization analysis of the survey respondents. Furthermore, a correlation analysis of the data and variables is presented in order to get a further insight into the relations between risk components, categories, financial literacy levels and demographic features.

The software used to analyse the data is the R Program.

3.1 Sample population.

This first paragraph describes the people who took part to the survey, analysing the answers of the "About you" section of the questionnaire. As previously explained, the survey was conducted using Amazon Mechanical Turk and structured in Qualtrics. It was taken by 130 people, but through attention check questions, 10 people were eliminated because they did not meet the necessary, minimum attention requirements established for the survey agreed in the terms and condition section of the questionnaire (for attention check explanations, please refer to chapter 2).

Age and Gender, Questions 22 and 23.

The survey was taken by both men and women, with a 40%-60% relation. The average age is 35.46, ranging from the younger person of 21 years old to the oldest of 67 years old.

Table 3.1: Summary results for Question 22 and 23.

```
     Q22              Q23
Female:48    Min.    :21.00
Male  :72    1st Qu.:27.00
             Median :33.50
             Mean    :35.46
             3rd Qu.:42.00
             Max.    :67.00
```

Source: student elaboration.

The boxplot below shows the distribution of male and female Workers, taking the age parameter as reference. The distribution is centred around the value of 34 years for the women and of 33 years for the men.

As it can be seen, the disposition of the median is not central, meaning that the age distribution is not symmetric and slightly skewed towards younger ages. In the man boxplot there can be observed an outlier, a 67-year-old man.

Table 3.2: Age and Gender boxplots.

Age boxplot
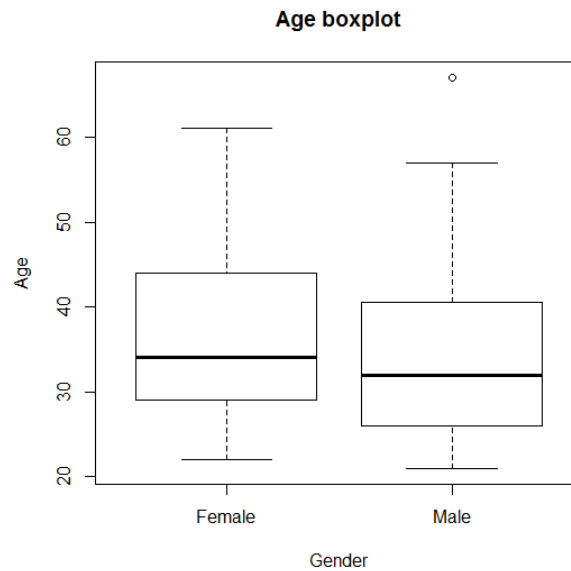
Source: student elaboration.

Questions 24-25.

Country of birth and Nationality revealed a sample almost entirely composed of US citizens, without immigrants or other nationalities included in the pool of subjects with only one person born outside the US (Russia) and another person with Ukrainian nationality but born in the US.

Table 3.3: Sample Country of Birth and Nationality.

```
                        Q24                              Q25
Canada                  :  1  Ukraine                    :   1
Russian Federation      :  1  United States of America:119
United States of America:118
```

Source: student elaboration.

Questions 26.

This question analysed the area in which Workers live, with the following results. As it can be seen from the chart, the majority of people live in big towns and considerably big cities.

Table 3.4: Workers' home places.

```
                                                      Q26
A city (100 000 to about 1 000 000 people)            :34
A large city (with over 1 000 000 people)             :17
A small town (3 000 to about 15 000 people)           :21
A town (15 000 to about 100 000 people)               :39
A village, hamlet or rural area (fewer than 3 000 people): 9
```

Source: student elaboration.

Questions 27.

The majority of people live on their own either because of their single status or because divorced (54%). The remaining part (46%) is either married or living with a partner.

Table 3.5: Workers' status.

```
                  Q27
Living with partner:13
Married            :42
Separated/Divorced : 9
Single             :56
```

Source: student elaboration.

The boxplots below relate the age of the Workers to their status for a further insight into the sample population. It is interest to remark how married people are more risk taking according to Chiavali (2016) because there are two incomes and therefore more money to manage, encouraging them to take also riskier assets.

Table 3.6: Status and age boxplots.
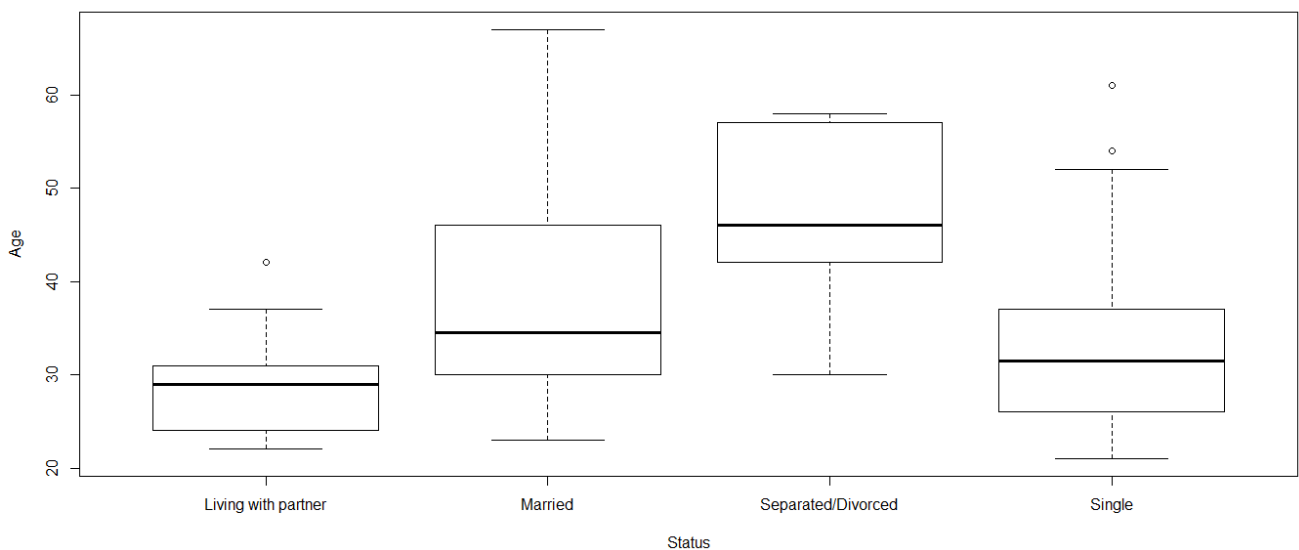
Source: student elaboration.

Question 29.

The dimension of the household was sought with this question, revealing that families are no bigger than 6 members.

Table 3.7: Household dimensions.

```
         Q29
Min.   :1.000
1st Qu.:1.000
Median :2.000
Mean   :2.383
3rd Qu.:3.000
Max.   :6.000
```

Source: student elaboration.

Question 30.

This question wanted to understand how much Workers may last, still covering the living expenses without having to move house or borrow money, if they lost their main source of income.

Table 3.8: Household financial possibilities.

```
                                                Q30
6                                              :  4
At least a week, but not one month        :15
At least one month, but not three months :33
At least three months, but not six months:16
Less than a week                          :14
More than six months                      :36
Prefer not to answer                      :  2
```

Source: student elaboration.

3.2 Results description.

This section provides an overview and a first step in the analysis of the data. Each question is carefully studied and reviewed. The numbers of the questions are the same ones used in the questionnaire that can be found in the Appendix. In the questionnaire there were also some control questions, that is why some numbers are missing.

Question 4.

Question number four was the first task for respondents in the questionnaire. The so called "Risk Task" (for details about the task design please refer to Chapter 2). The task was incentivized with monetary payoffs and the fact that the ball was randomly drawn by the computer (please refer to chapter 2 for details regarding the selection procedure) ensured that the respondents state their true preferences (Bade, 2013).

The chart below shows the summary of the answers collected. As it can be observed, it is clear that the great majority of the respondents preferred URN A in the first phases of the task, in particular in the first situation 96.6% of respondents prefer the "safe urn", the one in which there is a fixed and known number of balls, 5 white and 5 black respectively. This trend slowly changes as the number of white balls (which grant 10 points, that is a $1 bonus for the respondents) gradually increases. As it can be seen, the number of people who prefer URN A drastically decreases to 17/120, which is a 14% in situation 10.

In conclusion, there is a clear switching point in situation 6 in which both urns contain the same portion of white and black balls respectively, that is 5 of each colour in each urn.

Table 3.9: Summary results for Question 4.

```
> summary(mydata)
   Q4.1_1        Q4.1_2        Q4.1_3        Q4.1_4        Q4.1_5
 Urn A:116    Urn A:111    Urn A:109    Urn A:109    Urn A:106
 Urn B:  4    Urn B:  9    Urn B: 11    Urn B: 11    Urn B: 14

   Q4.1_6        Q4.1_7        Q4.1_8        Q4.1_9       Q4.1_10
 Urn A:90     Urn A:64     Urn A:41     Urn A:25     Urn A: 17
 Urn B:30     Urn B:56     Urn B:79     Urn B:95     Urn B:103
```

Source: student elaboration.

Question 6.

This question describes the pool of subjects who responded to the survey from an occupational point of view. The goal was to understand the composition of candidates. As it can be seen, the wide majority of people interviewed are workers, either in paid employment (60%), or as self-employed (24%). This is a good result because it very basically mean that these people have a salary and are therefore more likely to invest, having dealt with risky situation in the past/present and representing an excellent pool of candidates for the survey. The remaining 16% is given by unemployed people looking for a job, students (3%), unemployed people not looking for a job and others.

Results are reported in the following chart.

Table 3.10: Respondents current situation.

Situation	Number of respondents (120)	%
In paid employment (working for somebody else)	71	60%
Self-employed	29	24%
Looking for a job	5	4%
Student	5	4%
Not working and not looking for work	4	3%
Unable to work due to sickness or ill-health	3	2.5%
Other	3	2.5%

Source: student elaboration.

Questions 7, 8 and 9.

These series of questions investigated the background of the respondents of the survey.

As it can be seen from the analysis reported below, the great majority of respondents are workers, there is a large number of graduated people: most of them are individuals who have finished their studying career.

The first of the three questions was indeed asking what the level of education achieved so far or completed is.

Table 3.11: Respondents current situation.

Situation	Number of respondents (120)	%
Bachelor degree	57	48%
Technical/vocational education beyond secondary school level	26	21.5%
Complete secondary school	20	16.5%
Master degree	7	6%
Some secondary school	4	3%
Complete primary school	3	2.5%
Other	3	2.5%

Source: student elaboration.

As displayed in the chart above, 64.5% of the people have a university level of studies, implying a fairly educated pool of candidates. Of these, 16% have also achieved a master level education. The percentage of people who did not reach a relatively considerable level of education (completed secondary school) is very low: 5.5%.

The following question in the survey is strictly related to this, asking indeed whether the studies made were related to economics, finance, management: business fields. Surprisingly, only a small percentage was related to these fields (6.6%).

Yes: 8 (6.6%)

Q8. Is your degree/specialization in economics/finance/management?

No: 112 (93.4%)
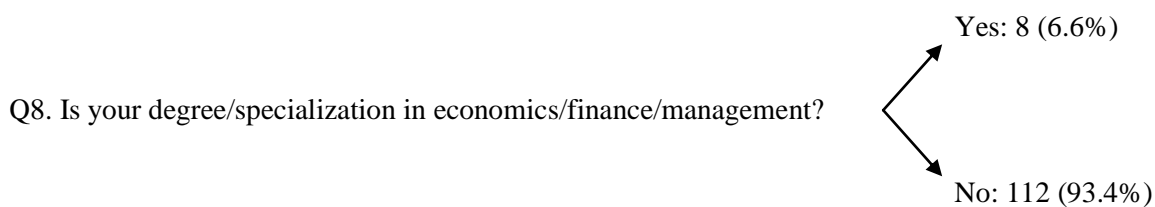
This finding is interesting because it means biased results should be expected when it comes to risk decisions. The correlation between these findings and risk components ranking and variables will be analysed in the next sections.

As it might be expected from this first question, the consequent result that follows from Q9 is that 94% are not working in a financially related environment, while only 6% are; justifying an expected average financial literacy score. Indeed, at the question about the current job position covered (Q9), only 7 people answered

saying they currently work in a business related environment. Of these, only 2 had a background in economic studies.

Q9. Are you currently working in a financial environment?　　No: 113 (94%)

Yes: 7 (6%)
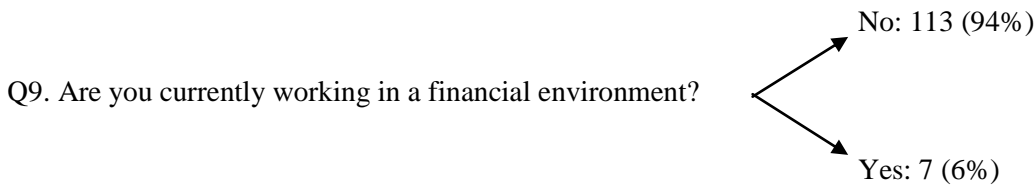
In conclusion, it can be stated that the people with a study background in economics or with a job in a business related environment are on the whole 11 (10%) of the whole sample population, as the pie chart below shows. In fact, among these people, only two studied economics and proceeded with a business related job.

Table 3.12: Respondents with business related backgrounds (studies/job).
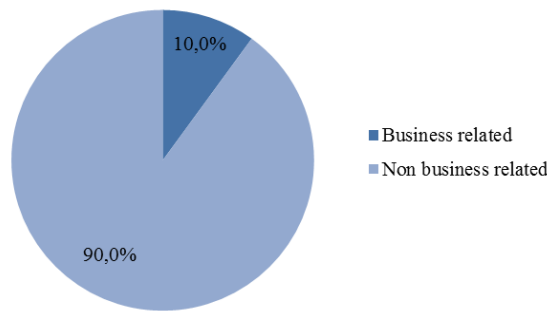
Source: student elaboration.

Question 10.

This question provided an insight into the regularity and reliability of the sources of income of the people who fulfilled the questionnaire. Amazon Mechanical Turk workers had the possibility to choose a number between 0 (not at all regular and reliable, respectively) and 10 (very regular and reliable, respectively) to define their source of income.

Table 3.13: Summary statistics for Question 10.

```
      Q10_1               Q10_2
Min.    : 1.000    Min.    : 1.000
1st Qu.: 5.000    1st Qu.: 5.000
Median : 8.000    Median : 8.000
Mean    : 7.042    Mean    : 7.208
3rd Qu.: 9.000    3rd Qu.: 9.000
Max.    :10.000    Max.    :10.000
```

Source: student elaboration.

As the chart above shows, the income of the people analysed is perceived to be fairly regular (with a median of 8 points out of 10) and fairly reliable (again, with a median of 8 points), thus indicating a good fundamental and stable base in order to consider investing decisions and having an inclination to enter the stock market world.

Question 11.

This question was used in the calculation of the financial literacy score, it was particularly useful as it provided an insight into people's knowledge and use of certain products.

Hereafter the results with the percentages of people mentioning each product/service, starting from the least popular to the most popular.

Table 3.14 People possessing/knowing the following:
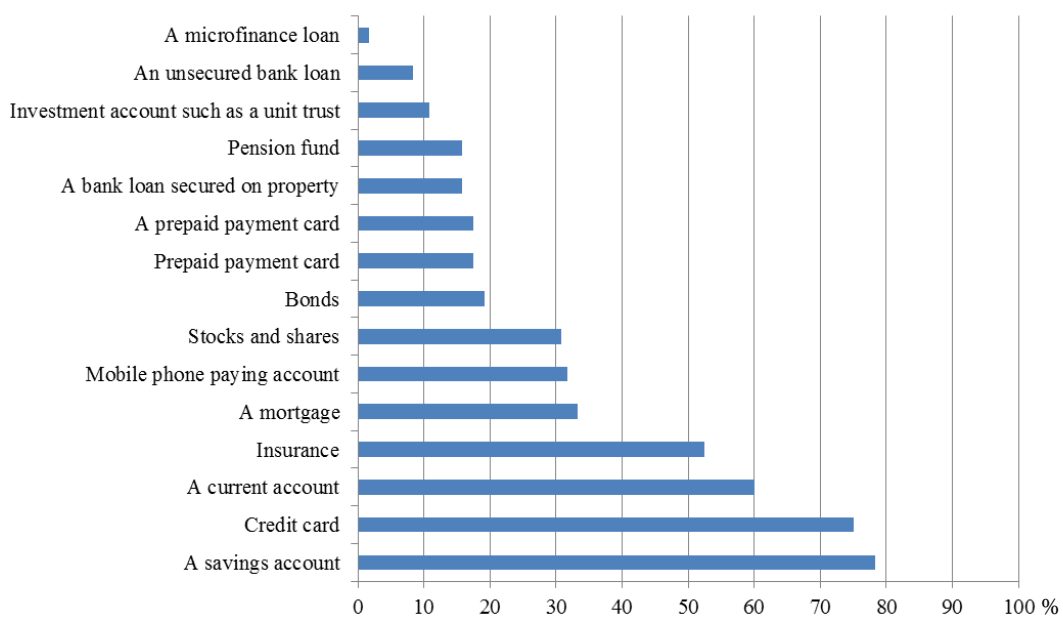
Source: student elaboration.

As it can be seen from the graph, the vast majority of people have a savings account, a credit card and/or a current account. Bonds account for 19% while stocks and shares slightly more with a 31% of people mentioning them.

Question 12.

Similar to the previous question in the structure, question 12 aimed at investigating the saving habits of the pool of subjects analysed and was as well used for the financial literacy score.

Table 3.15 Savings habits.

Paying money into a savings account
Saving cash at home or in your wallet
Building up a balance of money in your bank account
Buying financial investment products other than pension funds (bonds, stocks and shares)
I don't save/I don't have money to save
Giving money to family to save on your behalf
Saving in an informal savings club
Saving in some other way (including remittances or buying property)

0 10 20 30 40 50 60 70 80 90 100 %

Source: student elaboration.

As it can be observed from the chart above, 54% of the people interviewed have been actively paying money into a savings account; notably, another important 48% have been saving cash at home without making use of any bank account and up to 32% have been saving building up a balance in the bank account.

A considerable amount of people declared in the survey that they do not save or do not have money to do so, this fact was also reflected by the results on the open question (Q19) in which the same number of people (26) stated the same.

The most interesting part is made up of those people who actually invest in stock and bonds (22%), it will be interesting to see how these people relate to risk.

Question 13.

The data provided by these answers were as well included in the points collected for each person's financial literacy score. This was the first of a sequence of questions to test the understanding of financial markets and financial basis.

There was only a correct answer (exactly $102) and as R summary statistics show, the majority of people (67%) was able to compute interests on the savings account deposit.

Table 3.16: Summary results for Question 13.

```
                Q13
4               : 5
Exactly $102   :80
Less than $102: 2
More than $102:33
```

Source: student elaboration.

Question 14.

The risk return relation knowledge was very easily investigated in this question, which belongs to the section of materials collected for the financial literacy score computation.

Table 3.17: Summary results for Question 14.

```
                                                             Q14
3                                                            :16
A high expected return corresponds a high degree of risk    :91
The return of an investment is completely unrelated to its level of risk:13
```

Source: student elaboration.

As the chart above shows, 91 people got the correct answer in the questionnaire, that is 76% of the sample population. The other 24% is divided between people not knowing what the question was about (13%) and people getting the wrong answer (11%).

Some people mentioned this relation in the open question (Q19), concerning the factors considered when dealing with a risky situation and investment, saying the risk-reward ratio was an important feature to be considered when making investing decisions. Indeed, from that question, it emerged that 12% of the people considered the risk reward ratio in their investment decision making processes.

Of these, 6% declared that they would rather invest in something that leads to low returns but at the same time guarantees low risk, rather than having the possibility of very high returns but greater risk, meaning there is a clear risk aversion tendency.

While the other 6%, was a part of more rational people, saying the risk reward ratio was an important aspect to take into account, but not directly mentioning whether it is better to have a low risk-low returns situation or a high risk-high returns situation.

Question 15.

This question as well belongs to those questions used for the computation of the financial literacy overall score. Diversification is a fundamental concept in finance in order to reduce risk and indeed this was its objective: measuring the knowledge of Amazon MTurk workers of this concept.

Table 3.18: Summary results for Question 15.

```
                                                             Q15
3                                                            :13
Investing in shares of 11 companies belonging to different sectors:98
Investing in shares of 11 companies belonging to the same sector  : 9
```

Source: student elaboration.

As the results above show, when asked whether it is better to invest in shares of 11 companies belonging to different sectors (correct answer!) or in companies belonging to the same sector, 82% of the respondents showed to possess a good grasp of the concept of diversification, while 11% did not know anything about it and, finally, 7% chose the wrong answer.

Question 17.

This question compares the riskiness of bonds and stocks. In the table below the results used for the financial literacy insights are summarized.

Table 3.19: Summary results for Question 17.

```
                                      Q17
3                                       : 10
Bonds are normally riskier than stocks:  5
Stocks are normally riskier than bonds:105
```

Source: student elaboration.

As it can be seen, 105 participants (87.5) could properly answer to the question. The percentage of correct answers exceeds that of the previous questions about the risk reward ration and the reduction of risk through a diversified portfolio. This means that investors have a greater understanding of the general implications of different financial assets (specifically, bonds and stock) while poorer knowledge of financial issues and mechanisms such as diversification or the very basis relation between risk and return.

Question 18.

Strictly related to the previous one, this question dealt with the concepts of investments time horizons and differences between bonds and stocks, assets with which 22% of the respondents said to be investing with (please see question 12 for ulterior details).

When introduced with a time horizon concept, the people interviewed showed more confusion about the issue, even though the concept of risk between stocks and bonds seemed to fairly clear from the previous question results, implying a sort of superficial level of financial literacy.

In fact, as the table below shows, when asked which asset would normally give a higher return in a long term perspective (say twenty years), people reacted in several, quite spread, ways: 53.5% knew that stocks perform better in the long run comparing to bonds, 29% believed bonds perform better in the long run while 5% even mentioned savings account as the most rewarding option and, to conclude, 12.5% did not have an idea about it.

Table 3.20: Summary results for Question 18.

```
                   Q18
4                :15
Bonds            :35
Savings accounts: 6
Stocks           :64
```

Source: student elaboration.

Question 19 (includes semantic analysis and categorization of the respondents).

This was probably the question that absolutely provided one most interesting and direct insight into the composition of multidimensional risk for investors; the data collected was very interesting and useful.

It was formulated as follows:

Q19. Could you please list the things that come to your mind when you think about investment risk starting from the most important for you? Feel free to write as much or as little as you wish.

It was a very challenging question to analyse because it required treating singularly each answer in order to provide the best quality analysis results.

The analysis of this question will be divided in two phases: the analysis of the words used and a categorization of the people according to their answers.

The question asked to list the elements considered important for each person and, as previously explained, it was structured as an open question in order to let people free of defining risk and its components but also to let them convey their feeling and emotions.

This indeed led to a first analysis of the answers: each answer was carefully considered in order to collect macro categories of components and get an idea of the feelings that could emerge.

SEMANTIC ANALYSIS

Going through the answers (please refer to Appendix B for the complete list), the two major aspects that stood out were the fact that the risk asymmetry is very popular among investors and that risk is strictly connected to negative feelings as the word sentiment and semantic analysis will show. This result clearly contrasts with the classical financial theories presented in chapter 1, according to which investors are rational and make decisions that maximizes their utility thus having a complete spectrum of information to analyse before deciding. On the contrary, people are shown to be in many cases illiterate financially speaking and, furthermore, heavily biased in their decision making processes.

~ First of all, to begin this **semantic analysis** it is fundamental to understand what positive and negative connotations are. A phrase has a positive semantic orientation when it has good associations and a negative semantic orientation when it has bad associations (Turney, 2002).

Many answers are quite neutral in their connotation and, due to their brevity, it would be often hazardous to make too many assumptions. However, going through each one it is possible to grasp a major understanding of the more expressive ones. Consequently, on a preliminary analysis of the data, all the answers were analysed from a connotation point of view and each one was assign a symbol, as explained in the following chart:

Table 3.21: Connotation analysis structure.

+	Assigned if the connotation of the words and the overall sentiment were positive.
-	Assigned if the connotation of the words and the overall sentiment were negative.
B	Assigned if in the sentences there were both positive elements and negative ones, without a prevailing connotation. Typical attitude of more rational and sort of neutral in their answers investors.
0	Assigned if there was no answer or nothing valuable emerging for the purpose of the analysis.

Source: student elaboration.

As the graph shows, 54% of the answers presented strong evidence of positive and negative contents. The remaining 46% includes those people who declare they do not have money to invest and do not think about investment risk and those answers that were neutral or difficult to interpret without forcing results.

Figure 3.22: Connotation analysis results.
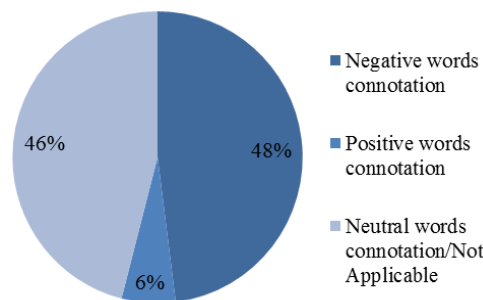
Source: student elaboration.

As the analysis illustrated, there is a widely spread, negative trend related to risk. Very few are the people (6%) that see something positive associated to it and even when that happens, it still has an allure of negativity: "*it's hard to predict, risk isn't **always** bad*". The remaining mentioned the chance of making big gains on their investment: "*investment risk is a tricky system that can really pay off if you're willing to put all of your cards on the table*". There was only one extremely positive about risk person, a real risk lover declaring "*the more the risk, the better*", because risk is about "*being brave*".

However, the idea conveyed in most of the answers (48%) is that bearing risk is something negative, financially demanding and mentally draining, there is a general "*fear*" of "*not making smart investments*". Negative connotation emerges from the words used in these answers; the concept of loss is widely used, risk is something that investors would rather avoid: "*I wouldn't do anything that'd risk me **losing** money*", "*I wonder how much money I will end up **losing***". There is a feeling of negativity even in those who declared that they do not have money to invest because investment implies losing money and many "*can't afford to **lose** a penny*". Fear of terrible events is also popular: "*a crash of the market, a bubble bursting*". The word "*bad*" is also recurring many times, in terms of investments and in terms of returns. Strongly negative are

also the words *"stressfull", "scary", "fear", "unpredictable", "dangerous", "lose your fortune", "lose it all", "lack of retirement"*. Some people also connected investment risk to the risk of not having money to retire in tranquillity. Furthermore, investing is considered by many as a very risky activity that only certain people can *"afford"*: *"I don't have any extra cash to **play** with stocks/mutual funds/bonds"*, it is a sort of exclusive activity aimed at losing money, at least in the mind of many. *"I also think it seems like something that only wealthier people do"*. The risk does not bring positive possibilities according to these people and brings danger to *"my future, my family, my job, my home, my savings, my income, my projects"*. Some answers were really anxious about investment risk: *"**losing money** needed for food, **losing money** needed for mortgage, **losing money** needed for bills, **losing money** needed for savings, **losing money** needed for retirement"*; anxiety is indeed one of the emotions that will be stressed.

In traditional finance risk is the variance of the probability distribution of possible outcomes that might follow the choice of the alternative/an investment (Westerfield, 2009). However, it is crystal clear from the data collected in this survey that for most investors risk is asymmetric, there is in fact strong evidence that investors only see the downside of risk, without considering the whole probability distributions of the outcomes and therefore having only a partial view of the outcomes: that of the negative ones. The downside risk is indeed the financial risk associated with loss, i.e. the risk of the actual return being below the expected return, or the uncertainty about the magnitude of that difference (McNeill et al., 2005). Risk in investments is in fact considered as something dangerous, an hazard (Shapira, 1987) that only some people can afford. It is not a mere probability concept as it is in academic financial theories but in reality it represents the possibility of negative outcomes in the perception of people and in their investment decision making processes. Furthermore, a risky investment is not simply one in which there is a wide range of possible outcomes that may be positive or negative, but rather one that contains a threat of a very poor outcome, of a loss as many of the answers collected in the survey show. This idea emerges also from researches by Dimmok et al. (2012), in which it is stated that stock market participants are, on average, wealthier, better educated and more likely living with a partner.

As Shapira (1987) highlighted, risk is strictly about losses in the common perception of people, investors and managers more in general, the emphasis is on these negative connotation words as it emerges from most of the answers collected.

The word **loss** was used 10 times in the answers, the word **lose** was mentioned 9 times and the verb **losing** 21. For a total of 40 times in the survey results, **loss aversion** is clearly expressed.

This result of widespread loss aversion is in line with other studies findings (Olsen, 1997; Olsen 1995; Shapira, 1995).

Table 3.23: An example of the widespread use of "losing" in the answers.

Losing money or investing in companies that close down
potential of losing all of my money. finished
not losing money finished
not making smart investments; gaining money; losing money; finished
I wouldn't do anything that'd risk me losing money. Finished.
I wonder how much money I'll end up losing. finished.
Losing all the money that was invested. finished
I think about higher risk and higher reward; I think about losing money too with risk;
losing money; reward; future plans
return; losing money finished
How much profit; how much risk; odds of winning and losing. Finished.
Stock market crashing; losing your 401K or life savings - Finished
losing my money   finished
losing money
Losing money needed for food; losing money needed for mortgage; losing money ne
Losing what I invest; Making money for retirement. Finished.
Losing money; unfamilar territory; finished
Losing all my money that I could have saved. finished.
I worry about losing my money in a way that I don't understand. I try to find the be
Losing my money

Source: multidimensional risk questionnaire data and student elaboration.

~ Indeed, about 6% of the Workers mention in their answers the fact that they would <u>prefer little reward with little risk</u> to think about rather than big returns and huge amount of risk. To quote one of the answers, "*I prefer lower risk investments. It makes me feel more **secure and stable**"*. Situations of uncertainty are not appealing to investors and qualities such as stability are highly valued. Moreover, "*Risk seems **unnecessary**. I'd rather have small reward with minimal risk*". It is something they try to avoid for many reasons. Another issue that emerges is knowledge and information available. Many people do not feel confident about bearing risks because they feel they lack the financial knowledge to understand and distinguish a good from a bad investment: "*The more risk, the more reward potentially. But **I would have to know a lot** about a product to know if the risk was worthwhile - which for the most part I do not - so I prefer to stick to lower risk diversified investments*". Again, "*I worry about losing my money **in a way that I don't understand**. I try to find the best balance of risk and reward, not allowing myself to be caught in a **bad** situation*". It is important to highlight also how most of the answers have negative connotations. The focus is on losses, on uncertainty, on fear: everything is negative, most of the times with the only exclusion of the few people (6%) who mentioned only "possible gains" in their answers. "*I think that one should take the least risk possible; because if you gamble at all you could **end up with nothing**. That's exactly what happened to me in this survey*"; this response makes refer to the risk task which was submitted in Question 4.

~ The <u>risk aversion</u> trend emerged many times from these answers (23%). Sometimes directly stated from the Workers "*I know very little about investment risk. I know that I am not much of a risk taker*", others clearly conveyed through the phrases used, "*I think one should take the least risk possible*"; "*risk seems unnecessary*"; "*I don't like to risk money at all*". By definition, risk has two characteristics: it is related to uncertainty and has consequences (Hillson, 2005). People are generally risk averse, in both traditional

finance and behavioural economics evidence, this means that they try to avoid uncertain situations. The graph below recalls the possible attitudes towards risk, the data collected with this survey however majorly highlight a strong risk aversion.

Table 3.24: Risk attitudes.
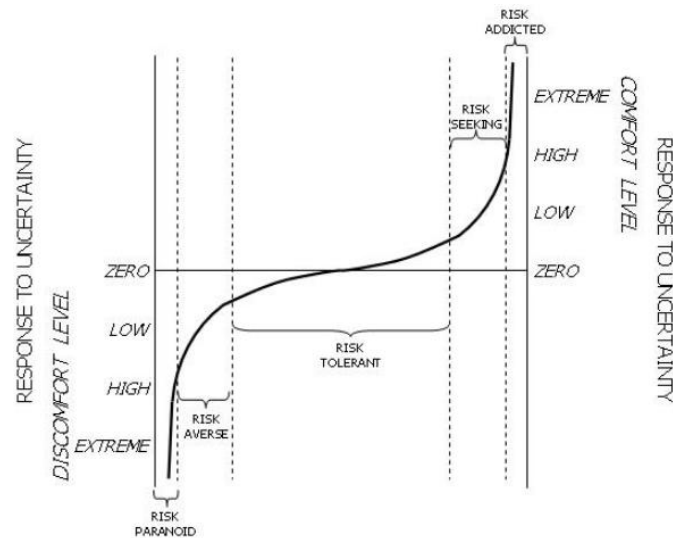
Source: Hillson, 2005.

~ Another important factor to be underlined in the analysis of these answers is indeed that of <u>emotions</u> that emerged when talking about risk. This stands out very clearly in 10% of the answers collected.

The words used to describe risk were emotionally negative: "*dangerous*", "*scary*", "*uncomfortable*", "*insecure*", "*unstable*", "*stressful*", "*unpredictable*", "*unfamiliar territory*", "*I don't like it, I'm scared of it*". Investing is defined as an activity which is "*too risky, it has to be something better to do it*".

As emphasized earlier in the analysis, risk is also a source of anxiety for many: a source of problems and losses for "*my future, my family, my job, my home, my savings, my income, my projects*". Some answers were really restless about investment risk: "***losing money** needed for food, **losing money** needed for mortgage, **losing money** needed for bills, **losing money** needed for savings, **losing money** needed for retirement*". A possible explanation of all this fear lies in a possible lack of education of financial market or in bad past experiences, which however cannot be investigated.

~ Last but not least, in this open question also a few <u>economic factors</u> were specified in about 16% of the answers collected. The results obtained are in line with a study (Clark-Murphy and Soutar, 2003) suggesting that when deciding to buy a particular stock, financial measures, such as dividend yield are relevant, together with the management tactics and information on the past performance of the stock.

Again, as for the other aspects highlighted so far, the analysis of the terms and concepts used by each person was carried out, considering each answer separately and making subgroups of the most used economic ones. This phase included an overall reading of the phrases collected followed by a selection of topics mentioned

and a computation of how many times each of these economic topic was used in the answers in order to detect the most popular ones and explain them hereafter.

Among the most mentioned are the volatility of the investment and the volatility of the market, followed by the knowledge of the stock. In fact, not only was information intended as information available about the stock, but also as the knowledge a person has about the stock. This implies a certain degree of familiarity bias in the investment decision making processes of these people.

Time horizon was another issue taken into consideration, with the idea that it is generally more likely to get better returns in the long run, but that it is nevertheless difficult not to panic if prices are checked daily with the many fluctuations of the stock market. This was very plainly explained in one answer in particular: "*As long as I'm focused on the long-term, risk doesn't bother me much. If I was checking prices daily, I'd be a lot more risk adverse*". This evidence is supported also by an Australian study by Clark-Murphy and Soutar (2003) focused on the determination of the economic attributes of shares that individual investors take into account in their decision making processes, whose findings led to the conclusion that the majority of individual investors have little interest in speculation and are, by nature, long-term investors. There are however anxious investors that keep checking prices daily, this causes the so called myopic loss aversion. This is a combination of a greater sensitivity to losses than to gains and a tendency to evaluate outcomes frequently (Thaler et al, 1997). The fact is also suggested by Benartzi (1993): loss-averse investors, with short holding periods, exhibit myopic loss aversion. Further experimental evidence of this phenomenon was provided also by Tversky and Kahneman (1992), Thaler, Tversky, Kahneman, and Schwartz (1997) suggesting that individuals elect more risky options when a long-term horizon is imposed externally.

The list below shows the major categories of economic/financial aspects mentioned in the valuation of risk by respondents.

- ♦ Volatility (of the stock/makert): xxxxxx
- ♦ Information available and information research: xxx
- ♦ Time horizon: xxx
- ♦ How easy it is to cash out: xx
- ♦ Dividend yield (possibly steady): xx
- ♦ Market performance/overall economic situation: xx
- ♦ Diversification: xx
- ♦ Management tactics: x
- ♦ Stock/bonds trend: x
- ♦ Cost benefit analysis: x
- ♦ Company performance: x
- ♦ S&P500 ratings: x

CATEGORIZATION ANALYSIS

The second step of the analysis of this open question was to create a categorization of the people who answered. On a first attempt, a matrix like the one showed below was built. It would have divided people in 4 categories depending on their answers: did they display an asymmetric distribution of risk or a complete distribution, did they show a rational attitude towards risk and investments or an emotive one?

Table 3.25: Matrix of the respondents, first trial.

	Rational	Emotional
Asymmetric distribution	Very loss averse	Very emotional and scared
Symmetric distribution	Standard investor	Risk lovers/ gamblers

Source: student elaboration.

However, this turned out to be an inefficient solution as not all participants provided enough information in their answers in order to make a categorization based on two sides.

The best solution to this problem was to classify the people according to what they were mentioning mostly in their answers, as follows:

Table 3.26: Respondents final classification.

Category	Symbol	Number of components	%
Asymmetry (losses only).	**L**	40	33.4%
Both losses and gains.	**B**	35	29%
Emotional.	**E**	12	10%
Gains only.	**Gains**	7	6%
No comment.	**0**	26	21.6%

Source: student elaboration.

In this way, a more efficient categorization of people was allowed: those mentioning both losses and gains clearly having a complete distribution of the outcomes of a risky situation (in this case, investments), those mentioning only gains (possible gamblers), those strongly emotional (probably affected by several cognitive and emotional biases), those seriously afraid of losing money featuring an asymmetry of possible outcomes strongly focused on the negative ones and, in conclusion, those that had nothing to declare either because they do not invest or because they did not mention anything. This last category also includes three people whose answers were not clear to understand or not meaningful for the survey.

As it can be observed from the data collected in the chart, the most numerous category is made up of those people presenting an asymmetric view of outcomes and risk, those considering only possible losses when making a decision. In fact, as Shapira (1987) explained, in many situations in real life risk is not thought in terms of the distribution of all (both positive and negative) possible outcomes, but only associated to the negative ones.

Question 20.

This question was strictly related to the previous one, as it further investigated the elements composing risk judgments in the mind of investor. To recall it, the question was formulated as follows:

How would you consider the following elements in the valuation of an investment risk? (From 0 not important at all to 100 absolutely important. Select "I don't know" if you don't know what the element is about).

Followed by the list of 14 elements to order in terms of importance.

The table below shows the summary statistics for its answers. The elements that the Workers were asked to rank were 14 and are displayed on the left.

Table 3.27: Summary statistics for question 20.

Element		mean	median	sd	valid.n
Beta, a measure of the volatility of a security or a portfolio in comparison to the market as a whole. (Q20_1)	Q20_1	42.99	49.5	36.30	120
Variance (Q20_2)	Q20_2	46.51	57.0	32.26	120
Financial ratios (Q20_3)	Q20_3	39.73	47.5	33.49	120
Familiarity with the brand/stock (Q20_4)	Q20_4	56.44	62.0	29.73	120
Past performance of the stock (Q20_5)	Q20_5	69.18	75.0	27.65	120
Liquidity (Q20_6)	Q20_6	43.38	49.5	31.64	120
High returns (Q20_7)	Q20_7	63.68	71.5	29.76	120
Information available (Q20_8)	Q20_8	72.22	80.0	28.47	120
Prestige of the investment ownership (Q20_9)	Q20_9	37.09	40.0	29.04	120
Time horizon (long term or short term investments) (Q20_10)	Q20_10	54.05	60.5	31.87	120
Economic uncertainty (Q20_11)	Q20_11	62.86	70.0	29.60	119
Geographic proximity (Q20_12)	Q20_12	26.18	20.0	26.08	120
Diversification (Q20_13)	Q20_13	63.19	71.0	30.63	120
The existence of financial analysts reports of the stock (Q20_14)	Q20_14	65.75	72.5	29.14	120

Source: student elaboration.

In this question each worker had to make his/her own ranking of the elements proposed. The analysis hereafter continues providing an overall ranking of these elements. The overall ranking was computed valuing the top 5 most important element for each respondent and then counting the ones that were mentioned most, thus creating the overall ranking.

It is interesting to note how the factor that presents the larger standard deviation is the Beta coefficient, with a value of 36.3. Whereas the factor that showed the least dispersion was the geographic proximity.

In the following chart ranking results are displayed.

Table 3.28: Overall ranking.

Position in the ranking	Factor
1	Information available
2	Past performance of the stock
3	The existence of financial analysts' reports about the stock
4	High returns
5	Diversification
6	Economic uncertainty
7	Familiarity with the brand/stock
8	Time horizon (LT or ST investment)
9	Beta (a measure of the volatility of a security or a portfolio in comparison to the market as a whole)
10	Variance
11	Prestige of the investment ownership
12	Liquidity
13	Geographic proximity
14	Financial ratios

Source: student elaboration.

It is interesting to note that the dominant factor in the ranking is that of the information available, which is usually part of an ambiguity concept rather than a risk one. In fact, from a theoretical point of view, the normal process is to value the risk and its probability of gains and losses starting from the information available one has. The fact that information available is at the top of the ranking also means that risk averse investors are risk averse according to Chavali (2016), because there is the tendency to consider multiple factors and seek diversified information before making investment decisions. The risk is here associated to the knowledge each person has of the investment, which in fact reminds more of an ambiguity concept rather than a risk one. People seem to be rather ambiguity averse and information is highly valued because it gives the feelings that investors' estimates and decisions are more accurate if there is information, the greater the amount of information available I have, the less uncertainty and dispersion of the results I have. An obsessive attention to information emerges from these results. This is a considerably important achievement as empirical studies indeed show that ambiguity aversion can explain, among others, patterns in stock market

participation (Ahn et al., 2014; Bianchi and Tallon, 2016; Dimmock, Kouwenberg and Wakker, 2016). To conclude, financial ratios are basically ignored by investors, as well as liquidity is.

Question 21.

This question aimed at providing understanding of the diversification habits and beliefs of investors. In particular, geographic diversification was addressed. Unsurprisingly (at least from a behavioural finance point of view), most of the Workers answered that they would prefer to invest in the stock of the region in which they live, ceteris paribus. Familiarity has a strong and pervasive influence on investment decisions (Huberman, 2001).

Table 3.29: Summary answers for Q21.

```
                                     Q21
     The one of another region.        : 17
     The one of the same region I live in.:103
```

Source: student elaboration.

As it can be seen from the results chart above, it is crystal clear that there is a strong tendency to prefer stocks that belong to the region people live in to another region, with a 86% of preference! This is a clear example of a lack of diversification in these people's investment portfolios. This effect is called home country bias in behavioural finance, highlighting the fact that people are often (up to 86% in this survey) stay-at-home-shareholders. People prefer to invest in the familiar and the local, even though barriers such as capital controls, opaque markets and the high cost for fund managers of setting up overseas for foreign investment have fallen (Huberman, 2001). The bias favoring the familiar reflects investors' optimistic trend towards what they feel affinity with, that is the comfortable and the familiar (Heath and Tversky, 1991). This trend was also studied in chapter one (please refer to paragraph 1.10), as a typical feature of investment biases.

Question 28.

This question was also taken into account for the valuation of financial literacy of the Workers who took part to the survey. It was an indicator of who bears the economic and financial decisions in the family of each respondent.

As it can be seen from the results below, the great majority of people (48%) are self-responsible for the financial decisions, this fact giving them more points in the financial literacy score computation. Although another considerable percentage of people take money decisions together with the partner (40%). Only a (6%) of the respondents is not directly involved in the family financial decision making processes and leaves the economics decisions to another person, either the partner or another family member.

Table 3.30: Summary answers for Q21.

```
                                                 Q28
Another family member or (or family members)    : 4
Someone else                                     : 1
You                                              :58
You and another family member (or family members): 7
You and your partner                             :48
Your partner                                     : 2
```

Source: student elaboration.

3.3 Financial literacy score.

One of the aspects fundamental for the multidimensional risk analysis was the understanding of how the level of financial literacy was related to investment decisions under uncertainty.

As explained in the previous chapter, the questions related to the financial literacy of the respondents were eight and the average score of the 120 respondents was 66/100.

Following the directives of OECD/INFE International Survey of Adult Financial Literacy Competencies, I have assigned each question a point if correctly answered. The questions used in the computation of the final score are: Q11, Q12, Q13, Q14, Q15, Q17, Q18 and Q28.

Questions 11 and 12 were given different weights: the maximum points were 1.8 and 1.1 respectively and more weight was given to the answers if they included stocks, investments accounts, bonds and shares for question 11, implying a more financially active/informed person.

Similarly, question 12 had different weights for each of the mentioned answers: people who had been saving through a balance of money in the bank, paying money into a saving account and/or buying financial investment products were given a slightly higher score. This was done in order to differentiate between the respondents saving money in a more traditional and risk averse manner from those attempting investing opportunities such as the ones mentioned above.

Each of the other questions was given a point if correct and the final score was then translated into a percentage.

The table below shows the frequency distribution of the financial literacy scores of the respondents. As it can be observed, the distribution is skewed to the left, indicating a fairly good level of financial literacy among the population of the sample.

The question that had the best performance in terms of knowledge was the Q17, about which asset is riskier between bonds and stocks. In contrast, the question that caused major problems between respondents was Q18, which required a slightly more advanced financial knowledge, about time horizon and returns. While the former led to a success percentage of 87.5%, the latter only led to a success percentage of 53%.

Table 3.31: Financial Literacy Score distribution.


```
FINLITSCORE
Min.    :   1.00
1st Qu.:  56.50
Median :  72.00
Mean   :  66.46
3rd Qu.:  83.00
Max.    :100.00
```
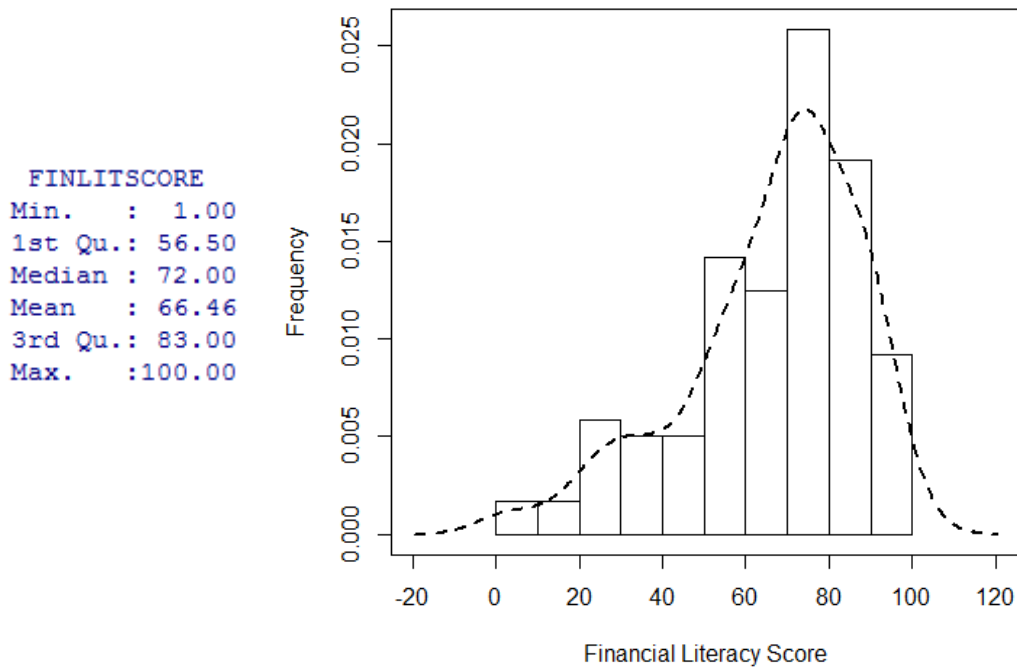
Source: student elaboration.

Overall results are positive and as Lusardi (2011) highlighted, the majority of respondents presents basic level of financial literacy, with a fairly good grasp of the basic concepts of interest compounding. However, when asked to combine concepts respondents showed a superficial knowledge as in the case of the question about the riskiness of stocks vs bonds and the one which added the time horizon of the investment and the returns to the basic difference between these two assets. Diversification is also an issue for some investors, who do not understand the importance of diversifying in terms of investments sector but also geographically speaking. As Lusardi (2011) found out in financial literacy studies, the financial knowledge of people affect the final decision making as those with low levels of literacy are less likely to invest in stocks, another clear representation of the familiarity bias.

3.4 Correlations.

This section looks at the correlations among the elements collected in the survey. The correlations were computed using the functional Spearman Rho correlation coefficient and the significance was valued considering the corresponding p-value. In order to have more solid results using the Spearman correlation and to have practical-sustainable results, the dichotomous nominal variables were discretized to zero and one. Indeed the goal is not that of explaining everything with a variable but rather to see if there is some link among them, in order to better understand what drives investor decision making processes.

3.4.1 Financial Literacy Scores and Demographics

Financial Literacy and Age.

The table below shows the scatter plot of Age and Financial Literacy Score. The red line represents the regression line while the blue line is the lowess line. As it can be seen, there is little correlation and weak significance between the age and the financial literacy level of respondents.

Table 3.32: Scatterplot - Age and Financial Literacy.
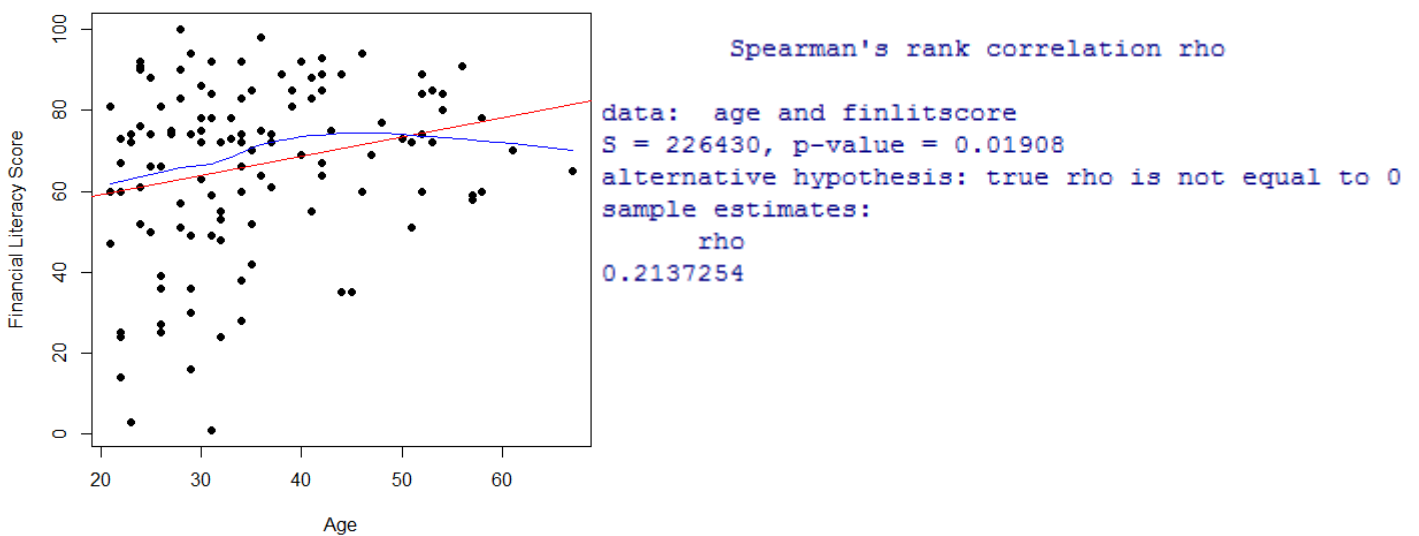
Source: student elaboration.

The correlation coefficient computed is of 0.2137254, meaning that there is very little correlation between the age of respondents and their level of financial literacy (Cohen, 1975) and not statistically significant.

Financial Literacy and Gender.

The average financial literacy score of the whole sample was 66%, with a sample median of 72%. The score was slightly higher for men, as the boxplot below shows. As it can be noticed, the distribution of scores is more spread among women than men, in fact there are only four outliers among the men displaying very low

levels of financial knowledge. Men have a starting score of 38. Furthermore, the distribution is more symmetric for men than for the women.

Table 3.33: Boxplot - Gender and Financial Literacy.
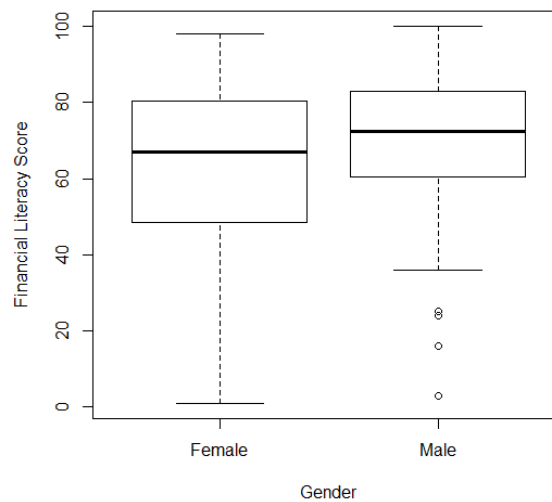
Source: student elaboration.

The correlation coefficient is negative: -0.1732216, with a p-value of 0.06238, indicating there is significance in the relation between gender and financial literacy scores. Other researches relating gender to financial literacy scores (Lusardi, 2014) report that men score slightly more in financial literacy tests. Single women present higher financial literacy scores comparing to married women who take financial decisions together with their partner. This gender gap is wider among 50-60 years old men and women.

Generally speaking, low levels of financial literacy have been linked by Lusardi (2016) to a lack or retirement planning, a strong connection with anchoring to financial losses, financial insecurity, borrowing at high cost interest rates and finally to lack of participation in the stock market. This fact was also brought to light by the semantic analysis of the open question explained earlier in this chapter: people fear investment risk because – as they often declare themselves – they do not know about it and they do not feel confident of it, consequently avoiding the source of risk, that is, the stock market.

Financial Literacy and Studies/Work background.

An interesting point of this survey was to verify whether the field of studies and the working environment play an important role in the determination of financial literacy score. For this purpose, questions 8 and 9 were aggregated and discretized. The correlation computed was of 0.08867897, while the p-value computed was of 0.3355, therefore not significant enough to prove a correlation between higher financial literacy score corresponding to people presenting studying careers in economics or financially related jobs.

3.4.2 Ranking and Financial Literacy Scores

The interesting correlations with elements of the ranking (hereafter, "ranking" is used with reference to the overall ranking of elements defining multidimensional risk given by respondents in questions number 19 and 20 of the survey. Ranking stands indeed for the overall ordinal classification that emerged from the data of question 20, unless otherwise stated) include:

- **Existence of financial analysts' reports**, with a correlation of 0.1 and a p-value of 0.3. This means that there is no significant relation between the level of financial literacy score and the importance of financial analysts' reports in the consideration of investing under uncertainty. Financially knowledgeable people do not necessarily tend to consider these reports more than less financially literate people. The presence of analyst's reports also signifies that the stock being consider for the investment belongs to a listed company.

- **Prestige of the ownership of the stock**, with a negative correlation of -0.16 and a p-value of 0.08 making it almost significant. This result makes positively thinking in the sense that it means that as the financial knowledge of investor increases, the less they consider the prestigious stock as an important factor influencing them in their investing decisions.

- **Geographic proximity**, another element presenting a negative correlation of – 0.16 and a p-value of 0.08, making it almost significant, implying more literate people rank this element less when dealing with risky decisions.

- **Financial ratios**, to conclude, show a positive correlation of 0.05 and a p-value of 0.54, implying that there is clearly no significant relation between the level of financial literacy and the consideration of financial ratios in risky investment decisions.

- **Beta**, presents a positive rho correlation of 0.24 with a p-value of 0.007: strongly significant.

- **Diversification**, presents a positive rho of 0.35 with a significant p-value of 0.00008, making it very important for financially literate investors.

In these results, the p-values for geographic proximity and prestige of the ownership are slightly higher than others. However, working with a small number of respondents, Alpha is set to 0.10 and given this level of significance, the p-values for these tests (0.08) provide sufficient evidence for the association between the variables and thus to believe that more literate people rank these elements lower when dealing with risky decisions.

Expectations were indeed that these economic factors would have been strongly related to the level of financial knowledge, because the more one is competent, the more he or she is – supposedly – likely to

consider financial elements in his/her valuation of a risky investment. Empirical results are quite supporting this perspective.

On the other hand, a study by Olsen (1997) presented some curious result: the study made a clear distinct analysis for the suggested characteristics of risk making a distinction between CFA (Certified Financial Analysts) holders and normal individuals. The study showed that only 22% of the CFA holders took into account business risk (beta, variance, debt level etc.) while 18% of normal individuals did it too.

For all the other values of less significant correlations please refer to Appendix C, table C.1.

The overall mean of the sample for the financial literacy score is 66, while the overall median is 72.

It is interesting to take into account also the mean and the median of the financial literacy scores of only those people who considered certain elements in their top 5 elements of the ranking (*). In other words, to compute the following means and medians, for each element were considered only those respondents who rated that element among their top 5 for importance in risky investment decisions. As it can be seen, beta is among the elements included in the top 5 ranking by those people showing highest financial literacy score mean and median (74), unexpectedly, variance is not given the same attention by high scoring people.

The elements voted as most important by people with the lowest financial literacy scores means and medians were: prestige of the stock ownership and geographic proximity indeed.

Table 3.34: Means and Medians (*partial).

Elements	Mean F. L. S.	Median F. L. S.	SD F. L. S.
All elements including	66	72	21.21
Beta	74.30	74	18.15
Variance	60.3	60	21.92
Financial ratios	70.69	71	20.74
Familiarity with the stock brand	67.70	72	19.33
Past performance	70.11	73	19.29
Liquidity	65	72	21.12
High returns	69.45	72.5	17.69
Information available	70.48	72.5	17.69
Prestige	58.41	69.5	23.47
Time horizon	73.05	75.5	19.25
Economic uncertainty	64.90	71	19.13
Geographic proximity	58.29	55	22.08
Diversification	74.26	75	15.55
Financial Analysts' reports	69.03	72	17.98

Source: student elaboration.

3.4.3 Ranking and Demographics.

Ranking and age.

When it comes to age, there is a positive correlation and quite strong significance with financial analysts' reports and diversification. On the other hand, age is negatively correlated to variance and, unexpectedly, liquidity. Details on the values are to be found in table C.2 in Appendix C.

Ranking and background (studies + work).

As the percentage of people with economic studies and of people working in a financial environment is relatively small, the correlation was made with the overall background: to see if people with a financial background have certain preferences.

From these data it emerges how economic uncertainty (with a negative correlation of -0.19 and a p-value of 0.03) is not considered at top levels in the ranking by people having a financial background. Another significant correlation that emerged from the analysis was how people with a financial background consider the beta more than less literate people. The correlation was of 0.26 and the p-value computed of 0.003.

Given the very low percentage of people with a financial/economic background of the whole sample population (10%), these results are to be handled with attention and to trust only up to a certain point. It can be also underlined nevertheless that familiarity has a negative correlation of -0.1 and is almost significant, suggesting that people with a strong economic background are less biased from familiarity of the brand/stock in their decision making.

Ranking and gender.

Correlations values for this relation were quite low, however, it must be said that it is better to have a low correlation with a high p-value for the significance, rather than a high correlation value with a low significance p-value. As previously reported in paragraph 3.4.2, alpha was set at 0.1.

Interesting and significant correlations were with familiarity of the brand (rho = 0.16 and p-value = 0.07), past performance (rho = 0.15 and p-value = 0.09) and liquidity (rho = 0.15 and p-value = 0.09). Indeed, 43% of the men against 27% of women ranked familiarity more importantly, despite the financial literacy earlier considerations.

When referring to risk, cultural factors may be responsible for this risk related gender effects. Women in fact are generally more risk averse than men and this happens even when decision-makers of both genders have the same level of expertise and experience. Talking of investments, non-professional women investors also appear to accept less risk than their male counterparts, age, education wealth and experience being equal (Olsen and Cox, 2001). There is no specific variable to blame for this gender difference in risk aversion and attitudes, it is probably due to cultural and social factors. According to Olsen (2001), women investors weight risk attributes, such as possibility of loss and ambiguity, more heavily than their male colleagues.

Table 3.35 shows how people of different gender ranked each element. The percentage for each element indicate the percentage of male and female respectively that ranked that particular element among the first elements for importance in the definition of investment risk; for this reason and also because not all participants voted their five top elements (as some of them declared they did not know what these elements were) they do not sum to 100.

As it can be seen, women give more importance to the existence of financial analysts' reports about the stock when making investment decisions, while men give considerably higher attention to the past performance of the stock, its liquidity, time horizon and information available. Interestingly, 43.1% of the men (compared to only 27.1% of women) give great importance to their familiarity with the brand of the stock, in the ranking of risk elements considered in investment decision making. The importance of the brand familiarity was also highlighted by a study from Macías et al. (2015) in which results showed that people are more likely to invest in a famous stock rather than in an unknown one when the risk-return ratio is already controlled, furthermore, the more popular the brand of the stock, the less the investment risk is perceived (which could explain why men rank so high the familiarity with the stock). However, no empirical evidence that men give more importance to this factor then women was provided in the study.

The complete ranking distinguished by men and women respondents respectively can be found in Table C.5 in Appendix C.

Table 3.35: Ranking and Gender.

%	Male	Female
Sample population	60.0%	40.0%
Beta	27.8%	27.1%
Variance	22.2%	22.9%
Financial ratios	13.9%	12.5%
Familiarity brand	43.1%	27.1%
Past performance	69.4%	54.2%
Liquidity	22.2%	10.4%
High returns	56.9%	47.9%
Information available	75.0%	66.7%
Prestige of the ownership	18.1%	18.8%
Time horizon	37.5%	27.1%
Economic uncertainty	44.4%	41.7%
Geographic proximity	15.3%	12.5%
Diversification	47.2%	47.9%
Financial analysts' reports	54.2%	56.3%

Source: student elaboration.

Both men and women rank information available as the most important aspect of the ranking, however greater emphasis is given to past performance by men, while women focus more on financial analyst's men, probably showing less self-confidence. In fact, as Lusardi (2015) highlighted in her research about financial literacy, when asked to personally assess their overall financial knowledge women across countries consistently give themselves lower marks then men.

Indeed, considering past performance implies personally making some research and considerations, while considering financial analysts' reports means that there is a tendency to trust people that are perceived as more competent in the subject and also trusting official news about the stock.

3.4.4 Ranking and Categories.

This section looks at the relations between the ranking, of which extensive explanations were provided earlier in this chapter, and categories, that i show respondents of the survey were divided according to their attitude towards risk. As a reminder, the categories were: those people having an asymmetric view of risk seeing only losses, those seeing only gains, highly emotive people showing fear and other emotions in their answers, those showing a complete distribution of risk and finally those excluded either because they were not investing or had nothing to declare. The '0' category people were excluded from this analysis, so only people showing clear behaviours were considered in these percentages.

Before starting to analyse the effects of categories on ranking, it is useful to provide a ranking of the elements according to each category of people. The results are displayed in the tables below:

Table 3.36: Elements' ranking according to categories.

	Ranking for category L	% people (*)		Ranking for category B	% people (*)
1	Information available	35.1	1	Information available	25.5
2	Financial analysts' reports	28.7	2	Past performance	25.5
3	Past performance	27.7	3	High returns	24.5
4	Economic uncertainty	23.4	4	Diversification	19.1
5	High returns	23.4	5	Financial analysts' reports	18.1
6	Familiarity brand	18.1	6	Time horizon	18.1
7	Diversification	18.1	7	Economic uncertainty	12.8
8	Beta	10.6	8	Familiarity brand	12.8
9	Time horizon	9.6	9	Beta	11.7
10	Variance	8.5	10	Liquidity	7.4
11	Prestige	7.4	11	Geographic proximity	7.4
12	Liquidity	4.3	12	Prestige	7.4
13	Financial ratios	3.2	13	Financial ratios	6.4
14	Geographic proximity	1.1	14	Variance	5.3

Ranking for category Gains		% people (*)
1	Information available	5.3
2	Past performance	5.3
3	Diversification	5.3
4	Financial analysts' reports	4.3
5	High returns	3.2
6	Liquidity	3.2
7	Economic uncertainty	3.2
8	Financial ratios	2.1
9	Geographic proximity	2.1
10	Beta	1.1
11	Variance	1.1
12	Familiarity brand	1.1
13	Time horizon	1.1
14	Prestige	0.0

Ranking for category E		% people (*)
1	Information available	8.5
2	Diversification	8.5
3	Financial analysts' reports	8.5
4	High returns	7.4
5	Past performance	6.4
6	Economic uncertainty	5.3
7	Time horizon	5.3
8	Beta	5.3
9	Familiarity brand	3.2
10	Variance	3.2
11	Liquidity	2.1
12	Geographic proximity	1.1
13	Prestige	1.1
14	Financial ratios	0.0

(*) computed without considering the '0' category of people.

Source: student elaboration.

The tables with all the correlation values are to be found in Appendix C. A few considerations are necessary here. It is interesting to notice how in general respondents of all categories preferred information available and other economic aspects such as the stock past performance, financial analysts' reports and high returns in their top 5 elements of the ranking.

People focusing mostly on Gains are visibly giving more importance to data: they want to know how fast they can sell the financial asset, how the stock performed in the past to see how it is likely to perform in the future, and, obviously, they care about high returns.

On the other hand, people focusing only on losses are characterized by a slightly negative correlation with geographic proximity and time horizon. People displaying a strong loss aversion therefore do not rank importantly these two elements.
Information available, financial analysts' reports and economic uncertainty on the other hand presented weak but positive correlations and almost significant p-values (0.06, 0.05 and 0.06, respectively), implying these elements of the ranking are sustained by this category of people.

Emotive people did not display significant relations with the elements of the ranking, the most considerable relation was that of financial ratios, with a quasi-acceptable p-value of 0.1. Unexpectedly there is little evidence that cognitive/emotional biases play a more important role for these people, these were expected to emerge at the top places of the ranking. In fact, among the most important factors for them as well there are

information available and economic elements such as diversification, reports, high returns and past performance of the stock.

People in the B category give importance to high returns and time horizon.

3.4.5 Financial Literacy Score and Categories.

The table below shows the average financial literacy scores according to each category. This is an interesting result because, as it can be observed from the values, the group that significantly distinguishes itself from the others in terms of scores is the group of "Losses", that is those people who do not have a complete distribution of risk but are dramatically focused only on losses. Indeed, this category presents a negative correlation with the financial literacy score even though there is not a significant p-value. Greater significance is displayed by the B category, whose people have a complete distribution in mind and are positively correlated with financial literacy (p-value of 0.067).

Table 3.37: Mean and Medians of Financial Literacy Scores by Categories and relative correlations.

	B	E	L	Gains
Mean	71.7	71	67	73
Median	74	74	72	72

Category	Spearman Rho Correlation	p-value
B	0.16788	0.06683
E	0.07422	0.4205
L	-0.03038	0.7418

Source: student elaboration.

3.4.6 Demographics and Categories.

This part aimed at checking whether demographic aspects had an influence on the composition of the categories in which respondents were divided.

Gender

Gender was the first one to take into account. Indeed as it can be seen it had a positive correlation with people having a more complete probability distribution, supporting financial literacy considerations on gender.

Table 3.38: Gender and Categories correlations.

% M	% F	Category	Spearman Rho Correlation	p-value
74	26	B	0.18712	0.04071
58	42	E	-0.01134	0.9022
50	50	L	-0.14434	0.1158

Source: student elaboration.

The pie charts below simplify the reading of the composition of the categories according to respondents' gender.

Figure 3.39: Gender categories' composition.
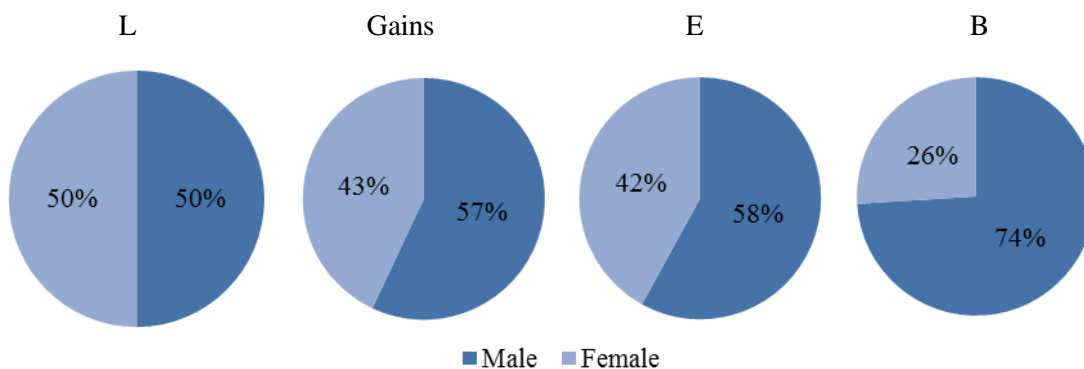
Source: student elaboration.

As it can be seen, men are more numerous in the B category, supporting the idea of Lusardi (2014) according to which they show more financial literacy and therefore are more likely to present a complete probability distribution when it comes to risk. Interestingly, the category of Losses is perfectly split in its composition.

Age.

The table below shows the correlations with age, as it can be seen, p-values indicate no considerable significance.

Table 3.40: Categories and age correlations.

Category	Spearman Rho Correlation	p-value
B	-0.02357	0.7983
E	0.08346	0.3648
L	0.10853	0.238

Source: student elaboration.

Background.

As treated before, this correlation combines the data of the studies with that of the jobs of the respondents as only a 10% of them has an economics/business/financial background or current occupation.

Table 3.41: Categories and background correlations.

Category	Spearman Rho Correlation	p-value
B	0.07128	0.4391
E	-0.02681	0.7713
L	-0.01896	0.8372

Source: student elaboration.

Due to the low percentage of people it is not easy to get solid results, however, it is clear that a financial background has a negative correlation with the categories of Emotive people and of people focusing only on losses, even though its significance is low.

Chapter 4: Conclusions

The Multidimensional Risk Survey has provided further evidence to support behavioural finance perspective according to which risk is not a mere number for investors. In fact, it is a much more complex concept defined by many elements which are given different importance according to investors' past experiences, their attitude towards risk, their financial knowledge and classical demographic characteristics such as gender, age and occupations. Investing decision making process is driven by the perception of risk and this is why this survey investigated its composition to provide understanding of what is really relevant when considering investment risk.

At the basis of the multidimensional risk theory is the fact that investors are not always rational decision makers and are influenced by both cognitive and affective biases as seen in chapter 1.

As far as the most relevant aspects are concerned, the survey revealed that respondents ranked above all the information available. The fact that information available was always at the top of the ranking, even among different categories is interesting indeed. People need information to make decisions of whether or not to invest in a certain stock. In particular, there are studies that emphasise how sometimes "less is more", in the sense that if an investor is given too much information it may not be necessarily a positive fact. This leads back to chapter 1 discussion on information overload, confusing investors and making it even more attractive for investors to make use of heuristics to simplify the process. This could perhaps partially explain the high ranking of financial analysts' reports, guaranteeing checks on the stock as it means that the company is listed and also providing properly displayed trustworthy information. In fact, according to Kaufmann and Weber (2013) aggregating information seems to reduce mental accounting, i.e. having one account for risky and one account for risk-free investments. A higher degree of information aggregation results in more risk taking as there is a lower risk perception and a more accurate estimation of the probability of a loss. This is a perspective that could partially explain this fact. Supporting this was also another study (Keller and Siegrist, 2011) stating that easier-to-understand products are perceived to be less risky: again, the emphasis is on information available for the investors.

The ranking continued with information available followed by the past performance of the stock, the existence of financial analysts' reports about the stock, high returns and diversification, among the first top five elements. Future behavioural economics research should focus on the relation between ambiguity and risk, as the fact that information available is ranking first suggests ambiguity aversion rather than strictly risk aversion. Diversification is intended in terms of stocks in a portfolio, but, apparently, not geographically because most respondents failed to understand the importance of geographic diversification in question 21 of the questionnaire.

Financial literacy assessment revealed a quite literate sample population, with an average score of 66/100.

Age and gender proved to have a certain impact on the level of financial literacy: there is a little gender gap between men and women financial literacy, in line with Lusardi (2016) surveys. Furthermore, financial literacy resulted being negatively correlated to elements of the ranking such as the prestige of the ownership of the stock and the geographic proximity (as a consequence, there is an incomplete understanding of what diversification is because, despite this result, most of the respondents got Q21 wrong as earlier explained). Beta as well is an element ranked by the most literate people. Curiously, financial ratios are not connected to financial literacy scores.

Another issue that emerged from gender correlations was that men rank familiarity of the stock brand much more importantly than women, while women give greater importance to financial analysts' reports regarding the stock.

The two major aspects that stood out from the semantic analysis were the fact that the risk asymmetry is very popular among investors and that risk is strictly connected to negative feelings as the word sentiment analysis showed. People never say "I'll take the risk of winning" something because risk has only a negative connotation for most people. Indeed the most numerous category was that of people displaying asymmetric probability distribution of risk and focusing only on losses. Anxiety, fear for the unknown and loss aversion aroused clearly from the answers.

Respondents were then divided into categories according to what emerged from their answers. Despite this information available was still ranked as the top element to consider in risky investment decision making situations by most of them, however some differences emerged from each category. People focusing on gains appeared to give more importance to elements giving them data on the past performance of the stock, on the returns and on its liquidity – the focus is clearly on money.
People focusing on losses, in contrast, gave more importance to economic uncertainty and analysts' reports, while ignoring financial ratios, geographic proximity and liquidity.

Great significance with financial literacy is presented by the category of people who have a complete distribution in mind, displaying higher levels of financial knowledge. Unfortunately, there was again evidence of gender correlation with financial literacy, as in this category men were abundant. However, on the other hand, it must also be said that the category of people focusing on losses reported a 50-50 percentage of men and women.

The findings of this survey are a basis for future research into multidimensional risk which can be applied in many situations. The concept of multidimensional risk goes beyond the field of finance and economics as it can be applied to many areas of daily life. This research considered general investments and stocks, but there is room for further specific research among all the wide range of financial assets available nowadays. Risk is

a concept that each people form themselves, focusing on a few aspects perceived as most important. There is multidimensional risk in environmental risk, in insurance, healthcare systems and relative issues, workers' salaries and so on and so forth. Furthermore, it might be interesting to explore how these risk components might be manipulated. For instance, as it has emerged that information available is the top element when it comes to investments, it might be interesting to see if there are – and there most likely will be – framing effects on how information is disposed and presented to investors. In conclusion, we do not have a number in our minds when thinking of risk, but rather the perception of risk is created according to our experiences, to who we are, to our culture and knowledge, to the information available we have.

APPENDIX A

In order to replicate the structure of the questionnaire as respondents viewed it, the questions are displayed in a new page whenever that was happening in the actual online survey.

Survey Questionnaire – An Insight into Multidimensional Risk.

Introduction and terms agreement.

Q1. Welcome to our multidimensional risk survey! We would like to investigate how risk is composed and perceived. This survey is being conducted for academic purposes, therefore we kindly request you to go through the questions carefully, to answer honestly at the best of your capacities. TERMS AND CONDITIONS:

- What you will do: fulfill a questionnaire.

- Time required: the survey takes around 15 minutes.

- By participating to this survey you incur in no risk and will remain anonymous.

- Compensation (for Mechanical Turkers only): you will receive an agreed amount for completing the survey. We screen all responses very carefully and compensation is adjusted based on quality of your responses: if you try to cheat and fail to answer basic control questions, your participation is considered to be fraudulent and no compensation is granted. This survey is part of our research, so it is essential that we adopt stringent guidelines for participation.

- We will not accept multiple submissions from the same IP address.

- We will only pay the workers who pass control questions by following the instructions.

- We will only pay workers who submit the required information: valid and unique ResponseID that is given at the end of the survey and the UserName (which one will have to create), along with their HIT.

- All of the above conditions are necessary in order to safeguard the integrity of our data and therefore to filter out cheaters (of which there are a very high number, unfortunately).

- Should you decide to withdraw by exiting the questionnaire, your submitted answers up to the point may not be used for the study purposes. Only complete questionnaires will be considered and paid for.

- Please also note that there is no back button and, therefore, there is no possibility to change submitted answers. Before starting, please check the box bellow if you understand the purpose and nature of this research and you agree to participate in this study providing honest answers to the questions. If not, just exit.

❍ Yes, I understand and agree to the terms of this survey. (1)

Understanding the task.

Q2. Part of your payoff for this survey is given as follows.

URN A: if a WHITE ball is drawn you earn 6 points. If a BLACK ball is drawn you earn 4 points.
URN B: if a WHITE ball is drawn you earn 10 points. If a BLACK ball is drawn you earn 0 points.

In case the ball drawn is "WHITE" and you chose the "URN A": what is your payoff?

○   40 cents (1)
○   60 cents (2)
○   1 dollar (3)
○   0 cents (4)
○   I don't know (5)

Condition: 60 cents Is Selected. Skip To: End of Block.

Q3. This is your second and last chance to read carefully and understand the question so please pay attention or you will be redirected to the end of the survey.

Part of your payoff for this survey is given as follows:

URN A: if a WHITE ball is drawn you earn 6 points. If a BLACK ball is drawn you earn 4 points.
URN B: if a WHITE ball is drawn you earn 10 points. If a BLACK ball is drawn you earn 0 points.

In case the ball drawn is "WHITE" and you chose the "URN A": what is your payoff?

- ○ 40 cents (1)
- ○ 60 cents (2)
- ○ 1 dollar (3)
- ○ 0 (4)
- ○ I don't know (5)

Risk task.

Q4. In this task you need to fill in the decision table shown below. The decision table consists of 10 different situations, listed 1 to 10. Each situation offers you a choice between drawing a ball from two different urns, urn A or urn B. Both urns contain 10 balls, either white or black.

- The composition of urn A is identical in all 10 situations. There are 5 white balls and 5 black balls.
- The composition of urn B changes from one situation to the next. The number of white balls increases incrementally from 0 white balls in situation 1 to 9 white balls in situation 10, while the number of black balls decreases accordingly.

At the end of the session, the computer will randomly select one out of the 10 situations. Then, depending on whether you have chosen urn A or urn B in that situation, the computer will randomly draw one ball from that urn. Depending on the color of the ball, you earn the points indicated in the table. Notice that even though you will make 10 decisions, only one of these will determine the points you earn, but you will not know in advance which situation will be selected (they are equally likely to be selected).

In each situation, from which urn do you prefer to draw a ball, urn A or urn B?

	URN A: If a WHITE ball is drawn you earn 6 points. If a BLACK ball is drawn you earn 4 point. URN B: If a WHITE ball is drawn you earn 10 points. If a BLACK ball is drawn you earn 0 points.	
	Urn A (1)	Urn B (2)
Situation 1) URN A: 5 white balls, 5 black balls. URN B: 0 white balls, 10 black balls. (1)	❍	❍
Situation 2) URN A: 5 white balls, 5 black balls. URN B: 1 white ball, 9 black balls. (2)	❍	❍
Situation 3) URN A: 5 white balls, 5 black balls. URN B: 2 white balls, 8 black balls. (3)	❍	❍
Situation 4) URN A: 5 white balls, 5 black balls. URN B: 3 white balls, 7 black balls. (4)	❍	❍
Situation 5) URN A : 5 white balls, 5 black balls. URN B: 4 white balls, 6 black balls. (5)	❍	❍
Situation 6) URN A: 5 white balls, 5 black balls. URN B: 5 white balls, 5 black balls. (6)	❍	❍
Situation 7) URN A: 5 white balls, 5 black balls. URN B: 6 white balls, 4 black balls. (7)	❍	❍
Situation 8) URN A: 5 white balls, 5 black balls. URN B: 7 white balls, 3 black balls. (8)	❍	❍
Situation 9) URN A: 5 white balls, 5 black balls. URN B: 8 white balls, 2 black balls. (9)	❍	❍
Situation 10) URN A: 5 white balls, 5 black balls. URN B: 9 white balls, 1 black ball. (10)	❍	❍

Payoff.

Q5. The ball drawn was ${e://Field/ball}. The question chosen was ${e://Field/random_question}. Your payoff is ${e://Field/Payoff}. Please select "previous question".

- ○ Next question (1)
- ○ Same question (2)
- ○ Previous question (3)

Education.

Q6. Which describes best your current situation?

- ❍ Self-employed (1)
- ❍ In paid employment (working for someone else) (2)
- ❍ Looking for work (3)
- ❍ Looking after the home (4)
- ❍ Unable to work due to sickness or ill-health (5)
- ❍ Retired (6)
- ❍ Student (7)
- ❍ Not working and not looking for work (8)
- ❍ Apprentice (9)
- ❍ Other (explain) (10) _____

Q7. What type of degree are you currently pursuing or is the highest degree you have completed?

- ❍ Ph.D. degree (1)
- ❍ Master degree (2)
- ❍ Bachelor degree (3)
- ❍ Technical/vocational education beyond secondary school level (4)
- ❍ Complete secondary school (5)
- ❍ Some secondary school (6)
- ❍ Complete primary school (7)
- ❍ Some primary school (8)
- ❍ No formal education (9)

Q8. Is your degree/specialization in economics/finance/management?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Partially related (explain) (3) _____

Q9. Are you currently working in a financial environment?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Partially related (explain) (3) _____

Q10. Considering all of the sources of income coming into your household each month, would you say that your household income is regular and reliable?

_____ Regular (1)
_____ Reliable (2)

Financial part.

Q11. Do you know any of these products?/Do you hold any of these

- ❑ A pension fund (1)
- ❑ An investment account such as a unit trust (2)
- ❑ A mortgage (3)
- ❑ A bank loan secured on property (4)
- ❑ An unsecured bank loan (5)
- ❑ A credit card (6)
- ❑ A current account (7)
- ❑ A savings account (8)
- ❑ A microfinance loan (9)
- ❑ Insurance (10)
- ❑ Stocks and shares (11)
- ❑ Bonds (12)
- ❑ Mobile phone paying account (13)
- ❑ Prepaid payment card (14)

Q12. In the past 12 months have you been saving money in any of the following ways?

- ❑ Saving cash at home or in your wallet (1)
- ❑ Building up a balance of money in your bank account (2)
- ❑ Paying money into a savings account (3)
- ❑ Giving money to family to save on your behalf (4)
- ❑ Saving in an informal savings club (5)
- ❑ Buying financial investment products, other than pension funds (bonds, investment trusts, stocks and shares) (6)
- ❑ Or in some other way (including remittances, buying livestock or property) (7)
- ❑ Has not been actively saving (including I don't save/I have no money to save) (8)

Q13. Suppose you put $100 into a savings account with a guaranteed interest rate of 2% per year. You neither make further payments into this account nor withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?

- ❍ Less than $102 (1)
- ❍ More than $102 (2)
- ❍ Exactly $102 (3)
- ❍ I don't know (4)

Q14. Each financial product is associated to a reward and a degree of risk. In your opinion, which alternative is more correct?

❍ A high expected return corresponds a high degree of risk (1)
❍ The return of an investment is completely unrelated to its level of risk (2)
❍ I don't know (3)

Q15. Investments diversification aims at reducing the risk of the portfolio. In your opinion, which of the following is more efficient to do so?

❍ Investing in shares of 11 companies belonging to different sectors (1)
❍ Investing in shares of 11 companies belonging to the same sector (2)
❍ I don't know (3)

Q16. Please select "very unhappy".

❍ Very happy (1)
❍ Very unhappy (2)

Q17. Which statement is TRUE?

❍ Bonds are normally riskier than stocks (1)
❍ Stocks are normally riskier than bonds (2)
❍ I don't know (3)

Q18. Considering a long time period (for example 20 years), which asset normally gives the highest return?

❍ Stocks (1)
❍ Bonds (2)
❍ Savings accounts (3)
❍ I don't know (4)

Investment Risk Attributes.

Q19. Could you please list the things that come to your mind when you think about investment risk starting from the most important for you? Feel free to write as much or as little as you wish. Write "finished" at the end of your answer.

Q20. How would you consider the following elements in the valuation of an investment risk? (From 0 not important at all to 100 absolutely important. Select "I don't know" if you don't know what the element is about).

_____ Beta, a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole. (1)
_____ Variance (2)
_____ Financial ratios (3)
_____ Familiarity with the brand/stock (4)
_____ Past performance of the stock (5)
_____ Liquidity (6)
_____ High returns (7)
_____ Information available (8)
_____ Prestige of the investment ownership (9)
_____ Time horizon (long term or short term investments) (10)
_____ Economic uncertainty (11)
_____ Geographic proximity (12)
_____ Diversification (13)
_____ The existence of financial analysts' reports about the stock (14)

Q21. If you are presented with two stocks with the same variance of returns and the same level of expected returns, would you prefer to invest in the stock of the region you live in or of another region?

○ The one of the same region I live in. (1)
○ The one of another region. (2)

About you

Q22. Gender

❍ Male (1)
❍ Female (2)

Q23. Age:

Q24. Country of birth:

Q25. Nationality:

Q26. How many people live in your city/town?

❍ A village, hamlet or rural area (fewer than 3 000 people) (1)
❍ A small town (3 000 to about 15 000 people) (2)
❍ A town (15 000 to about 100 000 people) (3)
❍ A city (100 000 to about 1 000 000 people) (4)
❍ A large city (with over 1 000 000 people) (5)

Q27. What is your marital status?

❍ Married (1)
❍ Single (2)
❍ Separated/Divorced (3)
❍ Living with partner (4)
❍ Widowed (5)

Q28. In your house, who takes day to day decisions about money?

❍ You (1)
❍ You and your partner (2)
❍ You and another family member (or family members) (3)
❍ Your partner (4)
❍ Another family member or (or family members) (5)
❍ Someone else (6)
❍ Other (please explain) (7) _____

Q29. What is the size of your household (number of people in the family living together)?

Q30. If you lost your main source of income, how long could you continue to cover living expenses, without borrowing any money or moving house?

- ❍ Less than a week (1)
- ❍ At least a week, but not one month (2)
- ❍ At least one month, but not three months (3)
- ❍ At least three months, but not six months (4)
- ❍ More than six months (5)
- ❍ Don't know (6)
- ❍ Prefer to skip this question (7)
- ❍ Other (explain) (8) _____

APPENDIX B

Answers collected from Q19.

This Appendix includes a list of the 120 answers registered for the question related to the components of multidimensional risk. Please note that there is no editing in the answers, therefore some English mistakes and typos may be found.

Q19. Could you please list the things that come to your mind when you think about investment risk starting from the most important for you? Feel free to write as much or as little as you wish.
Write "finished" at the end of your answer.

- finished
- how much money I would make. finished
- I need more money to invest, and then I will know how I feel about the risk. finished
- finished
- Whichever option gave me better luck. Once Urn B had more white balls; I went to that. finished
- Not losing a significant portion of my investment is first. Secondly, I think about potential reward (specifically over the long term). I also consider diversification but don't have enough money right now to really do so...finished
- finished
- I don't like to take a lot of risks because I don't want to lose money but investment risk makes me think of things like cars because you invest in it and eventually you will sell off that car and hopefully it will still have high resale value when you're done with it. finished
- Risk vs reward, cost benefit analysis, how volatile the investment is, what the maximum payout is, finished
- Losing money or investing in companies that close down
- volatility, market performance, company performance finished
- I don't know finished
- potential of losing all of my money. finished
- safety or the return of principal is more important to me than the return on principal..... finished.
- retiremenr, loosing it all, finished
- riskiness finished
- the more the risk the better. Finished
- How much do I stand to win. How much do I stand to lose. How well do I think the investment will perform. I am comfortable and secure without investing any more. finished

- Making money is most important to me. Investment risk percentage is less important than absolute risk. I'd rather risk $50 than $10,000
- not losing money finished
- What's important for me is to balance risk and reward. finished
- not making smart investments, gaining money, losing money, finished
- I prefer low risk options with low returns. Finished
- I wouldn't do anything that'd risk me losing money. Finished.
- Low risk is important to me. FInished
- earnings, time investment, time for return on investment, finished
- More money, could lost it all, volatile, uncertain, taking a chance, finished
- Risky, can't afford it, has to be something better, why am I always so broke finished
- I wonder how much money I'll end up losing. finished.
- Losing all the money that was invested. finished
- I think about higher risk and higher reward, I think about losing money too with risk, I also think of high reward too though, finished
- When I think about investment risk, I think about how well you can percieve the trend in stocks and bonds. When I decide to invest I feel that I will invest in a number of stocks, in order to keep myself safe from one stock plummeting. From proper research, you can make yourself a nice sum of money. finished
- losing money, reward, future plans
- a crash of the market, a bubble bursting, volatile stocks etc
- I worry about my returns even in low risk ventures. There is always a chance your money will be lost to a bad investment. Finished.
- Lose of money. Bad investments. Lack of retirement. finished
- high returns, diversified risk, finished
- return, losing money finished
- I prefer lower risk investments. It makes me feel more secure and stable. finished
- scary, stressful, unpredictable, finished
- The degree of risk is the most important factor for me finished.
- How much money do I have to risk. finished
- The main things I think about are that I'd rather have the money right here and available to me instead of sitting in the stock market. I also think it seems like something that only wealthier people do. I don't know of anyone personally who has money invested in the stock market. finished
- Stop loss, management, finished
- increase in money finished
- The risk of financial loss. finished.

- I don't have any extra cash to play with stocks/mutual funds/bonds. finished

- I know very little about investment risk. I know that I am not much of a risk taker. Finished

- stock market volatility, overall economic situation, individual investment volatility, corruption in business and government, fair investment markets, finished

- Stocks, bonds, money loss, money gain finished

- dangerous, lose your fortune, diversifying, finished

- possible loss of principal and having to pay taxes on earnings finished

- How much profit, how much risk, odds of winning and losing. Finished.

- Hard to predict, risky isn't always bad, finished

- invest in a new product that hasn't had an established base finished

- gambling, foreign investing, security, finished

- I think about balancing as much return as possible without taking a loss. finished.

- money, risk, loss, finished

- As long as I'm focused on the long-term, risk doesn't bother me much. If I was checking prices daily, I'd be a lot more risk adverse.

- Stock market crashing, losing your 401K or life savings - Finished

- i don't know much about it finished

- Will i lose more money than I invested in the first place? For example, if I invest 1,000 is the lowest I could go with regard to loss 1,000 or could I lose everything I own? "finished"

- losing my money   finished

- Is the investment return high? What is the management tactics? How much does it require? How easy is it to cash out? finished

- making money, taking risks, being brave, finished.

- Potential loss of money. finished

- My future, my family, my job, my home, my savings, my income, projects. finished

- I have no investments finished

- Security, return, time, outlook, cost, finished

- finished

- One of the best ways to reduce on investment risk is to always invest in stocks and bonds over a long period of time to get good returns. finished.

- Considering i don't have much money, any kind of investment is fairly risky. finished

- finished

- losing money

- I don't like it, I'm scared of it, I don't know what else you want me to write, finished.

- Loss of money and high returns finished

- time, money, retirement, still have money to have fun, finished

- potential reward, loss verses gains, available funds, finished

- the market flucuates and there is always some risk involved. You have to decide if the risk is worth taking finished

- Losing money needed for food, losing money needed for mortgage, losing money needed for bills, losing money needed for savings, losing money needed for retirement, finished.

- I needed to save more for my retirement. finished

- A person should only take as much risk as they are comfortable with. finished

- scary finished.

- finished

- Reliability, return. Finished.

- I should start picking the other option at half point so it increases my chances of getting 10 points. finished

- Dividend Yield, Return on investment, S&P 500 rating, total uutstanding shares, finished.

- That there will always be risk. Finished

- lack of free money to invest, can't afford to lose a penny. finished

- I don't have much income to invest, so I don't think about it. finished

- I don't like to risk money at all, finished

- I have no particular thoughts.

- When I think about investment risk I think about the possibility of getting a big return on my investment. finished

- nothing, finished

- finished

- too risky, kind of scary

- iT Was fun. finished.

- Risk. Reward. finished

- Losing what I invest, Making money for retirement. Finished.

- The biggest thing about risk for me is stocks with low volatility and/or ones that provide a steady dividend income. Finished

- The amount you save is far and away the most important factor as you start investing. Nothing else comes close.finished

- Investment risk is a tricky system that can really pay off if you're willing to put all of your cards on the table finished.

- Risk seems unnecessary. I'd rather small reward with minimal risk. finished

- Losing money, unfamilar territory, finished

- The more risk then potentially the more reward but I would have to know a lot about a product to know if the risk was worthwhile which for the most part I do not so I prefer to stick to lower risk diversified investments. finished

- Losing all my money that I could have saved. finished.

- I worry about losing my money in a way that I don't understand. I try to find the best balance of risk and reward, not allowing myself to be caught in a bad situation. Finished.

- That would definitely be investing in stocks.Although I have to say that I have a 401K and it sometimes worries me a lot when I think of what could happen to it if the market goes down. Finished

- finished

- Well, because we were just talking about it, diversified portfolios are important to minimizing risk. It is important never to invest more than you can afford to lose. I also think it is important not to get greedy, cash out on your investment when the cashing out is good, because it can be risky to stay in something longer and longer hoping for a bigger and bigger return. Things can change quickly.

- finished

- Losing my money

- It is on me to do my due diligence on every transaction. Sometimes risk can be mitigated based on knowledge of a subject. finished.

- chance of high return

- Many people are afraid of the stock market because they are not educated about it. The younger you are, the safer it is to invest so to speak because time is on your side as long as you are making informed decisions. Finished.

- the chance the stock has of going up or down

- More risk often comes with more payoff if things go well. Finished.

- I think that one should take the least risk possible, because if you gamble at all you could end up with nothing. That's exactly what happened to me in this survey. Finished.

- finished

- I want to earn more finished

APPENDIX C

Data correlation tables.

This Appendix includes all the table summarizing the correlations and p-values computed for the data analysis with R program and explained in Chapter 3.

Table C.1: Ranking and Financial Literacy Scores:

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	0.2366431	0.009262
Existence of Financial analysts' reports	0.09507633	0.3016
Diversification	0.3511564	0.00008408
Familiarity with the brand	0.01198828	0.8966
Beta	0.2439387	0.007254
Variance	-0.1697621	0.06379
Prestige of the ownership of the stock	-0.1573892	0.08602
Geographic proximity	-0.156007	0.08885
Financial Ratios	0.05629492	0.5414

Source: student elaboration.

Table C.2: Ranking and Age.

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	0.06625228	0.4722
Financial analysts' reports	0.2843196	0.001649
Diversification	0.2972304	0.0009781
Familiarity of the brand	0.0007494211	0.9935
Beta	0.003504811	0.9697
Variance	-0.1798867	0.0493
Prestige	0.004977754	0.957
Geographic proximity	-0.100804	0.2733
Financial ratios	-0.004249545	0.9633
Past performance	-0.01848572	0.8412
High returns	0.04488144	0.6264
Economic uncertainty	0.1751527	0.05569
Time horizon	-0.04034781	0.6617
Liquidity	-0.1809034	0.04801

Source: student elaboration.

Table C.3: Ranking and Financial Background.

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	-0.01884219	0.8381
Financial analysts' reports	-0.008084257	0.9302
Diversification	-0.009396109	0.9189
Familiarity of the brand	-0.09829675	0.2855
Beta	0.265714	0.003355
Variance	0.1332332	0.1469
Prestige	0.1120247	0.2232
Geographic proximity	0.01217438	0.895
Financial ratios	0.09990871	0.2776
Past performance	-0.1242619	0.1763
High returns	-0.05016149	0.5864
Economic uncertainty	-0.1965924	0.03139
Time horizon	0.03791852	0.6809
Liquidity	0.1217249	0.1854

Source: student elaboration.

Table C.4: Ranking and Gender.

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	0.09059765	0.3251
Financial analysts' reports	-0.02051525	0.824
Diversification	-0.006812659	0.9411
Familiarity of the brand	0.162375	0.07641
Beta	0.007619172	0.9342
Variance	-0.008147062	0.9296
Prestige	-0.008792249	0.9241
Geographic proximity	0.03902485	0.6722
Financial ratios	0.02001602	0.8282
Past performance	0.1553152	0.09029
High returns	0.08865102	0.3356
Economic uncertainty	0.02746175	0.7659
Time horizon	0.1082532	0.2392
Liquidity	0.152211	0.09699

Source: student elaboration.

Table C.5: Ranking according to Gender.

#	% Male	Element
1	75.0	Information available
2	69.4	Past performance
3	56.9	High returns
4	54.2	Financial Analysts' reports
5	47.2	Diversification
6	44.4	Economic uncertainty
7	43.1	Familiarity brand
8	37.5	Time horizon
9	27.8	Beta
10	22.2	Variance
11	22.2	Liquidity
12	18.1	Prestige
13	15.3	Geographic proximity
14	13.9	Financial ratios

#	% Female	Element
1	66.7	Information available
2	56.3	Financial Analysts' reports
3	54.2	Past performance
4	47.9	High returns
5	47.9	Diversification
6	41.7	Economic uncertainty
7	27.1	Beta
8	27.1	Familiarity brand
9	27.1	Time horizon
10	22.9	Variance
11	18.8	Prestige
12	12.5	Financial ratios
13	12.5	Geographic proximity
14	10.4	Liquidity

Source: student elaboration.

Table C.6: Ranking and category L

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	0.1699964	0.06342
Financial analysts' reports	0.1776673	0.05222
Diversification	-0.07079923	0.4422
Familiarity of the brand	0.0855953	0.3526
Beta	-0.03959038	0.6677
Variance	-0.04233338	0.6462
Prestige	-0.01522862	0.8689
Geographic proximity	-0.2365756	0.009283
Financial ratios	-0.1213407	0.1868
Past performance	0.0244558	0.7909
High returns	0.02362278	0.7979
Economic uncertainty	0.166478	0.06917
Time horizon	-0.1625	0.07618
Liquidity	-0.1395726	0.1284

Source: student elaboration.

Table C.7: Ranking and category E

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	-0.03698634	0.6884
Financial analysts' reports	0.07816961	0.3961
Diversification	0.1279378	0.1638
Familiarity of the brand	-0.08070002	0.3809
Beta	0.1057575	0.2503
Variance	0.01995614	0.8287
Prestige	-0.0861461	0.3495
Geographic proximity	-0.05576141	0.5452
Financial ratios	-0.1307441	0.1546
Past performance	-0.0922286	0.3164
High returns	0.03340766	0.7172
Economic uncertainty	-0.01121121	0.9033
Time horizon	0.05892557	0.5226
Liquidity	-0.007310574	0.9368

Source: student elaboration.

Table C.8: Ranking and category B

Elements of the ranking	Spearman Rho Correlation	p-value
Information available	-0.04407691	0.6326
Financial analysts' reports	-0.0829185	0.3679
Diversification	0.05048156	0.584
Familiarity of the brand	-0.03170468	0.731
Beta	0.05645779	0.5402
Variance	-0.126227	0.1695
Prestige	0.0276395	0.7644
Geographic proximity	0.1073444	0.2432
Financial ratios	0.07191175	0.4351
Past performance	0.0697503	0.449
High returns	0.1592487	0.08233
Economic uncertainty	-0.1171612	0.2025
Time horizon	0.2074252	0.02301
Liquidity	0.04222003	0.6471

Source: student elaboration.

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