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RISK TAKING, DIVERSIFICATION BEHAVIOR AND FINANCIAL LITERACY OF INDIVIDUAL INVESTORS*

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Abstract

This research investigates whether the financial literacy of individuals influences risk taking decisions and diversification behavior. This issue is relevant in that investors are increasingly in charge of their own financial security, but they have to deal with financial instruments whose increasing complexity often eventually prevents them from making conscious investment decisions.
Prior empirical evidence shows that people are unable to perform a "sophisticated" portfolio diversification: what they do is to split equally their wealth among the asset classes available, in a naïve way. We try to detect if the financial literacy is a driver of this kind of decisions.
By submitting a questionnaire to 200 American individuals, we find that financial literacy plays a role in risk taking decisions, positively affecting how much risk individuals are willing to take. Moreover, only those who are literate in terms of diversification select less risky portfolios; the others merely increase their risk exposure, without managing it. Consistently with the previous literature, the strategy of diversification adopted by the literate ones is mainly naïve. Instead, financial literacy turns out not being significant in explaining more sophisticated diversification strategies.
As financial literacy affects positively the amount of risk taken by individuals, but only partially the diversification strategies pursued, there might be a dangerous pitfall in today's financial education programs promoted by governments and regulators, which, though they make investors more aware of their investment decisions, they eventually push them to assume more risks than they are able to manage. Two possible ways to tackle this issue could be: 1) to boost the financial literacy of the investors so as to make them able to use all the investment techniques required by the standard theory. This, however, seems difficult to obtain; 2) to promote advisory activity among investors. This may help them to apply the diversification principle in a sophisticated way.

Keywords: risk taking, diversification behavior, financial literacy

JEL Classification: G02, G11,

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1. Introduction

In recent years, all major economies have been very active in promoting financial education programs among individuals. Investors are, in fact, increasingly in charge of their own financial security but they have to deal with financial instruments whose increasing complexity often eventually prevents them from making conscious investment decisions. This phenomenon – which goes under the name of "financial illiteracy" – is one of the factors which account for several well-documented mistakes of such investors as well as for their failing to plan for saving and retirement. Financial illiteracy is, therefore, also a problem of public interest, whose relevance has been exacerbated by the recent financial crises. This paper investigates whether the financial literacy is a driver of risk taking decisions and diversification behaviour, in order to understand if and how these programs can help individuals to efficiently allocate their money.

The traditional theory of finance assumes that investors, independently of their knowledge of financial issues, optimize their investment portfolios, minimizing risks and maximizing returns exploiting the diversification principle. These assumptions have been strongly criticized in the last forty years by psychologists and experts of finance [e.g. Kahnemahn, Tversky, 1974, 1979, 1984, 1992], who gave rise to a stream of research labeled as "behavioral finance", as opposed to the traditional approach. According to these studies, agents are not rational (in the economic sense) when making decisions but follow irrational and simplified mechanisms of choice. For example, looking at the investment decisions, it was proved that they are not able to deal with the notion of correlation; therefore they do not diversify their portfolios according to the predictions of the classical theory but they rather split equally their wealth among the different asset classes available (i.e. they perform a naïve diversification strategy) [Kroll, Levy, Rapoport, 1988a and 1988b; Weber, Camerer, 1998; Siebenmorgen, Weber, Weber, 2001; Benartzi, Thaler, 2001]. Furthermore, more recent studies claim that a poor financial literacy amplifies this attitude, as it does not allow individuals to consciously pursue their financial welfare [Guiso, Jappelli, 2008].

Therefore, in order to support the investment process of investors, we have assisted, both at national and international level, to the rise of many financial education programs. However, it is not clear if and how these programs can actually help individuals when deciding about their money.

Our study focuses on this aspect and investigates if not sophisticated investors take and diversify risk according to their level of financial literacy. In order to answer to this research question, we submitted a survey to 208 American individuals, reached through Amazon Mechanical Turk, who had been previously selected for their not being professionals in the financial industry.

Our results provide many interesting contributions on both the importance of financial education and on the controversial role of the advisory. First of all, we find that financial literacy plays a role

in risk taking decisions, positively affecting how much risk individuals are willing to take. Moreover, only those who are literate in terms of diversification select less risky portfolios; the others merely increase their risk exposure, without managing it. The strategy of diversification adopted by the literate ones is mainly naïve: in fact, financial literacy turns out not being significant in explaining more sophisticated diversification strategies

Therefore, there might be a dangerous pitfall in today's financial education programs, which, though they make investors more aware of their investment decisions, they eventually push them to assume more risks than they are able to manage. Two possible ways to tackle this issue can be: 1) to boost the financial literacy of the investors so as to make them able to use all the investment techniques required by the standard theory. This, however, seems difficult to obtain; 2) to promote advisory activity among investors. This may help them to apply the diversification principle in a sophisticated way [Cavezzali, Rigoni, 2012]

The paper is organized as follows: Section 2 reviews the literature; Section 3 describes the dataset; Section 4 defines the research design; Section 5 presents our findings; Section 6 concludes.

2. Literature review

Our research idea was inspired by 3 streams of literature: on the one hand, the Modern Portfolio Theory, which has in Markowitz's seminal paper (1952) its foundations; on the other hand, the studies investigating the individuals' ability in applying the diversification principle [Kroll, Levy, Rapoport, 1988a, 1988b; Shefrin, Statman, 2000; Duchin, Levy, 2009]; finally, the more recent studies about financial literacy [Lusardi, Mitchell, 2006, 2008; Lusardi, Mitchell, Curto, 2009, 2010; Van Rooij, Lusardi, Alessi, 2007; Lusardi, Tufano, 2009], which show that investors, despite making frequent financial decision about, e.g. saving, planning for the future, mortgages, the use of credit cards, etc., have a very poor knowledge of the basic principles of finance and this leads them to be not fully aware when they take risk. What we want to understand in this paper is whether the financial literacy is actually a driver of risk taking and, in particular, of portfolio diversification strategies.

Although more than fifty years have passed since Markowitz (1952) first developed his theory, the mean-variance framework is still a landmark for asset allocation and active portfolio management. However, this theory is based on very strong assumptions: first of all, individuals, who are utility maximizers, know the notion of diversification and the underlying statistical concept of correlation. In the last twenty years, many experimental works [Kroll, Levy, Rapoport, 1988; Lipe, 1998; Weber, Camerer, 1998] have proved that the average portfolio selection process of investors differs

from the traditional approach [Markowitz, 1952], and so do the actual portfolio holdings and portfolio management [Blume, Friend, 1975; Kelly, 1994; Fisher, Statman, 1997a and 1997b].

Other studies concentrated on the diversification behavior and found that individuals do not take correlations into account when making portfolio investment decisions [Kroll, Levy, Rapoport, 1988a and 1988b; Weber, Camerer, 1998; Siebenmorgen, Weber, Weber, 2001; Benartzi, Thaler, 2001]. Being the investment activity not so intuitive, the majority of investors recur to advisors, who propose asset allocation solutions and manage investors' portfolios on their behalf. These figures must evaluate investors' risk attitude and their investment time horizon before any advise and, in some countries (e.g. the European ones), must educate their clients about risk. However, either advisors – who can be considered sophisticated agents – and individuals (not necessarily sophisticated) seem to follow a simplified rule when deciding about how to diversify their portfolios: they overlook about the notion of correlation and they use a "1/N strategy", which implies to split equally their wealth among the asset classes available (notoriously money market funds, bonds and stocks), in a naïve way. Siebenmorgen and Weber (2003) propose a behavioral asset allocation model in which advisors' recommendations fit perfectly a model made of three components: expected returns, pure risk (defined as the weighted sum of the risks of the different assets in the portfolio, without considering the correlations) and naïve diversification. Benartzi and Thaler (2001) find applications of this rule in many individuals' retirement allocations. Others [Jobson, Korkie, 1980; Michaud, 1998; Duchin, Levy, 2009; DeMiguel, Garlappi, Uppal, 2009] prove that the naïve rule can even outperform the Markowitz's rule. Thus, being sophisticated or not seems to produce quite similar results in terms of diversification.

On the other hand, recent studies have focused their attention on the assessment of individuals' financial literacy, whose definition is as follows: "the ability to make informed judgments and to take effective decisions regarding the use and management of money" (Noctor et al, 1992). The evidence shows that financial illiteracy is widespread among the U.S. population and particularly acute among specific demographic groups, such as those with low education, women, African-Americans, and Hispanics [Lusardi, 2008]. However, research is still little on this topic and the few existing studies indicate that individuals lack knowledge of even the most basic economic principles [Lusardi, Mitchell, 2006, 2007a; Hilgert, Hogarth, Beverly, 2003]. At the same time, there are concerns that households are not saving enough for retirement, are accumulating excessive debt, and are not taking advantage of financial innovation [Lusardi, Mitchell, 2007b; Campbell, 2006]. The existing studies have also shown that those who are not financially literate are less likely to plan for retirement and to accumulate wealth [Lusardi, Mitchell, 2006, 2007a], and are more likely to take up high-interest mortgages [Moore, 2003]. Despite the low levels of literacy displayed by

many individuals, very few of them rely on the help of experts or financial advisors to make saving and investment decisions [Lusardi, 2008]. Low literacy and lack of information affect the ability to save and to secure a comfortable retirement; ignorance about basic financial concepts can be linked to lack of retirement planning and lack of wealth. Financial education programs can help to improve saving and financial decision-making [Williams, 2007], but much more can be done to increase the effectiveness of these programs.

Our study offers an original contribution to this topic, as it investigates whether the level of financial literacy is a driver of risk taking and diversification behavior, influencing the way in which investors perform asset allocation strategies. Our results fill a gap in the literature because they allow understanding if the low capacity of individuals to diversify their portfolios can depend on their generalized financial illiteracy. Moreover, we enrich the more recent literature about naïve diversification as opposed to the traditional diversification *à la* Markowitz. The research also offers some interesting insights for regulators and authorities, who are facing the increasing need to educate investors and must decide which direction to give to these education programs.

3. The data collection

We collected data through an online questionnaire which was submitted in May 2012, using Amazon Mechanical Turk (AMT) as distribution channel [Behrmester M., Kwang T., Goslin S.D., 2011]. We reached 208 U.S. individuals who had been previously selected for their not being professionals in the financial industry. They were paid a flat rate of $0.25 each.

The questionnaire, fully reported in the Appendix, is made of three sections: a first section aimed to ascertain how individuals take risk and define asset allocation strategies; a second one designed to determine the individuals' level of financial literacy; and a third one dedicated to collecting the respondents' personal information.

As far as the first set of questions is concerned, aimed to understand how individuals take risk and choose a plausible asset allocation, we have asked our respondents to imagine this situation (we used the example proposed by Siebenmorgen and Weber, 2003): they have a friend, characterized by a specific socio-economic profile and investment goals, who needs advise on how to invest a certain amount of money he has just inherited by his deceased grandmother. The investment alternatives available are given and represented by the following asset classes: short term monetary funds; bonds; blue chips stocks; small cap stocks; foreign stocks. Together with a brief definition of each asset class, respondents have also been provided with a description of the risk-return features of each of them. Given this set of information, respondents have been asked to recommend a possible asset allocation, taking into account their friend's risk attitude. The questionnaire has been

designed in such a way that each respondent had to propose three asset allocations, imagining that their friend was alternatively: cautious, moderate, risk lover. The three risk profiles have been proposed in a randomized order, ruling out possible automatic choices.

Table 1 summarizes the overall decisions taken by our respondents. In particular, it shows the average results of the total sample (lines 2-5 at the top of the table) and those regarding the three different risk profiles: cautious, moderate (well-balanced portfolio), aggressive.

Insert Table 1.

The columns indicate respectively: three measures of portfolio risk, defined in details in the next section (columns 2, 3, 5); a measure of "theoretical risk" (column 4), in which we assume all asset classes have correlation equal to 1 (fitting the case of absence of diversification) and, finally, the average choices in terms of asset allocation (columns 6-10). It's pretty evident that our respondents invested on average 26.71% of their friend's portfolio in short term monetary funds, 25.35% in bonds, 21.56% in blue chips, 13.72% in small caps and 12.66% in foreign stocks. The standard deviation of the average asset allocation chosen is equal to 16.76%, indicating a pretty high variability among respondents' choices. It's worth being mentioned that the portfolio risk (measured by the variance) of the average asset allocation proposed is equal to 9.33% with a standard deviation equal to 4.82%.

The column labeled "Herfindahl" indicates the well-known Hirschmann-Herfindahl index and provides information about the diversification of the portfolio, with respect to the asset classes available: an index equal to 1/N (in our case 1/5 = 20%) reveals a perfect naïve diversification; an index equal to 100% reveals the complete absence of diversification. The average value of this index is equal to 36.43% indicating a tendency to prefer some asset classes (typically short term investments, bonds and blue chips) with respect to others and, therefore, to concentrate their portfolios.

Finally, column 5 reports the diversification benefit (see the next section for a full explanation), implicit in the asset allocation chosen: a value greater that 0 indicates an effort (aware or not) to exploit the correlations among the different types of investments and, therefore, to implement a sophisticated portfolio diversification.

If we pay attention to the choices taken in the three risk profiles proposed, we can notice some peculiarities. For the "cautious" profile, the average asset allocation proposed suggests to invest 30.78% in short term monetary funds; 35.17% in bonds; 17.24% in blue chips; 8.73% in small caps and 8.09% in foreign stocks. The risk taken is small (with a standard deviation equal to 4.01%). The

Herfindahl index, which captures possible naïve diversification strategies, is greater than 20% (which would indicate an equal split of investors' wealth among the asset classes available) and amounts to nearly 41%, showing a preference to concentrate investments in mainly 2 asset classes (short-term funds and bonds). As far as the "moderate" profile is concerned, the tendency is to diversify more, investing less in short-term funds and bonds and more in stocks. The average portfolio riskiness increases of 2 points percent respect to the "cautious" profile but the Herfindhal index decreases to 33.24%, confirming the tendency to invest more in all the asset classes available. Finally, as for the "aggressive" profile, the stock component increases and the bond one decreases; also the foreign stocks component significantly increases. The overall portfolio risk increases (average equal to 10.56%) but the Herfindhal index remains similar to the "well-balanced case" (34.26%), as investors are slightly shifting their money allocation from bonds to stocks (blue chips, small caps and foreign) without changing substantially the percentages invested in the asset classes available.

Moving to the second part of our questionnaire, we put five questions to our respondents in order to assess their level of financial literacy. The questions are taken from the existing literature on this topic. The first one investigates respondents' knowledge of interest compounding (FL_interest rates); the second one the effect of inflation on the purchasing power (FL_inflation); the third one the diversification concept (FL_diversification); the fourth one the riskiness of bonds and stocks (FL_risk) and, finally, the fifth one investigates again the knowledge of interest rates in a more complex setting (FL_lottery). Table 2 reports the statistics regarding each question.

Insert Table 2

As the table suggests, our respondents present a good level of financial literacy. The first question was correctly responded by 89% of the participants (with a little percentage in favor of women); the second one was correctly answered by 78.37% (equally split between men and women); as for the diversification concept, 71.63% of our respondents gave the right answer; nearly 90% knows the difference in terms of riskiness between stocks and bonds; finally, only 62.50% was able to correctly solve the problem regarding the choice between the immediate collection of a win at the lottery and the delayed collection, demonstrating to be not so familiar with the rules behind interests computation. It's interesting to notice that in our sample, despite what previous studies find [Chen, Volpe, 2002; Lusardi, Mitchell, 2008], women and men have nearly the same level of financial literacy. Moreover, the presence of the alternative "I don't know" in each question prevented from

replying at random. There are not missing data in our dataset as we forced each respondent to reply to all the questions if he/she wanted to get at the end of the questionnaire and get paid.

Finally, in the third part of our survey, we collected respondents' personal data. In particular, we got information about gender, age, occupation, marital status, risk attitude and education.

As Tables 3 and 4 suggest, 45% of our sample is made of men and the remaining 55% of women. The average age is 37 but women are on average older (39 years old against 34 for men). 37% of our respondents is single, 36% married; 15% in a relationship; 6% divorced; 2.40% widowed and 1.91% separated. As for the occupation, more than 50% are students; more than 18% employee; nearly 16% is unemployed while the remaining 15% is dividend between self-employed and retired. The education level is high and has an average value between 4 (high school) and 5 (bachelor). In terms of risk attitude, our respondents are predominantly risk neutral (54%), with women more risk lover than men.

Insert Table 3

Insert Table 4

4. Research Design

To investigate the relationship between the financial literacy of individuals and their asset allocation choices, we assume that this kind of decisions are typically made at two levels: one where investors must decide how much risk they are willing to take (i.e. they have to choose among more or less risky assets), and one where they can decide to exploit the diversification principles to reach the target level of risk. In fact, a certain level of risk can be hit investing in just one low risky asset or diversifying among different risky assets, not perfectly correlated.

Prior literature distinguishes between two main classes of diversification behaviour: the sophisticated and the naïve one. The first one derives from the Modern Portfolio Theory, dating back to Markovitz's seminal work (1952). It suggests investors to optimize the risk-return exposure of their investment portfolios, splitting their wealth over different assets, considering the correlation between them. Unfortunately, this task is generally quite complex and demanding. For this reason, psychological studies [e.g. Tversky, Kahneman, 1981; Simon, 1955 and 1979; Payne, Bettman and Johnson, 1992] show that decision makers adopt, in practice, various kinds of simplifying diversification heuristics, [e.g. Simonson, 1990; Read, Loewenstein, 1995]. Specifically, when the number of macro asset classes (N) is relatively small, investors prefer to apply a naïve diversification strategy, simply investing an equal fraction of money (1/N) in each asset class

offered [Huberman, Jiang, 2006].

We investigate whether the financial literacy influences both the amount of risk and the diversification behaviour of investors with the following model:

$$RISK_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i \quad (1)$$

where *i* represents each individual whereas the set of independent variables summarizes the financial literacy level of individuals, their risk profile and their cultural and socio-demographic background.

Specifically, the *FIN_LITERACY* variable is a vector of the following five dummy variables: *FL_INTEREST RATE*, *FL_INFLATION*, *FL_DIVERSIFICATION*, *FL_RISK*, *FL_LOTTERY,* that are equal to 1 if the respondent's answer is correct, 0 otherwise. The "I do not know" answer is treated as missing value.

The qualitative information regarding sex (*SEX*), job (*JOB*)[†], marital status (*STATUS*) is codified as dummy variables as well. Age (*AGE*) is treated as a quantitative variable, while the risk attitude (*RISK_ATTITUDE*) and the education level (*EDUCATION*) of the respondent has been translated into a numeric scale, respectively from 1 (risk aversion) to 3 (risk loving) for risk attitude, and from 1 (lowest education level) to 7 (highest education level) for the education level. To capture the potential joint effect on the dependent variable of the financial literacy in association with the individual risk attitude, we also introduce some interaction variables between each of the five financial literacy dummies and the respondent's risk attitude. Thus, *FINLIT_RISK* is a vector of five interaction variables (*RISKATT_INTERESTRATE, RISKATT_INFLATION, RISKATT_DIVERSIFICATION, RISKATT_RISK, RISKATT_LOTTERY*).

As a control variable, we also insert in the regression the hypothetic risk profile suggested to the respondent (*RISK_PROFILE*).

In our framework, the dependent variable *RISK* has three different specifications depending on the dimension of the risk taking decision analysed. Therefore, we test three different regression models. Specifically, in the analysis, we keep separated the risk amount dimension and the diversification

[†] The list of respondents' jobs has been reduced to the following five classes:
1) Not employed;
2) Student;
3) Employee;
4) Self-employed;
5) Retired.

In the regression we insert four out of five variables for the over-identification issue.

strategy dimension.

First, to investigate how the financial literacy of individuals affects the amount of risk taken, we use as dependent variable the overall portfolio risk selected by the respondent (*PORTFOLIO_RISK*). We measure the portfolio risk as the variance of each portfolio composed by our respondents, using the five asset classes offered in relation to the three risk profiles suggested. Each asset class (liquidity, large cap stocks, small cap stocks, bonds and foreign stocks) is fitted by a market index, used as a benchmark. Thus, we measure the portfolio risk by calculating a variance-covariance matrix of daily returns over a 10-year time horizon for each benchmark and using the weights attributed to each asset class by each respondent. In more formal terms:

$$PORTFOLIO\_RISK_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i \quad (2)$$

where *PORTFOLIO_RISK* indicates the portfolio variance.

Then, we test the relation between financial literacy and diversification behavior among different asset classes. We distinguish two opposite diversification strategies documented in the literature: the naïve strategy and the sophisticated one. For each strategy, we calculate a specific diversification measure and insert it in the model as dependent variable.

The first measure is the Herfindhal index (*HERFINDHAL*) and represents the naïve diversification behavior. It is defined as:

$$HERFINDHAL = \sum_{j=1}^{N} w_j^2$$

where w_j is the percentage invested in the asset class j. The index takes value 1 when the portfolio is invested only in one asset class, and value 1/N when the resources are split equally among the suggested asset classes.

The second measure captures the diversification benefit, i.e. the portfolio variance reduction when the returns of the assets (or asset classes, in our case) are not perfectly correlated, given the weights attributed to each of them by each investor. We call this index *DIVERBEN* and it is defined as:

$$DIVERBEN = \frac{\sigma_{p/\rho=1}^2 - \sigma_p^2}{\sigma_{p/\rho=1}^2}$$

where $\sigma_{p/\rho=1}^2$ is the variance of the portfolio returns when all the correlations are set equal to 1 and σ_p^2 is the actual portfolio variance.

In our framework, as asset weights were always positive, the index takes values close to 0 when the correlations among asset classes are close to 1 and/or when the asset weights are heavily

concentrated.

We hypothesize that the joint interpretation of the relation between each index and the financial literacy sheds light on the role of the financial literacy in making investors more aware in risk taking decisions.

In more formal terms, we test these models:

$$HERFINDHAL_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i \quad (3)$$

$$DIVERBEN_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i \quad (4)$$

where the independent variables have been defined previously.

5. Findings

Tables 5, 6 and 7 report the main empirical findings of our models. Table 5 shows the results of model (2), testing the relation between the risk taken by the respondents and the financial literacy variables.

Insert Table 5

As shown in the table, the financial literacy variables related to the knowledge about interest rates and inflation have a significant positive impact on the portfolio risk, while the financial literacy variable representing the knowledge of the diversification paradigm has a significant negative impact. The net effect on these three variables is positive. Instead, the variables related to the knowledge of the interest compounding in the lottery setting and of risk are statistically not significant.

These results suggest a first conclusion: the financial literacy plays a role in risk taking decisions, affecting how much risk the individuals are willing to take. In other words, more financial literate individuals are bolder in exploiting the opportunities offered by financial markets, taking higher levels of risk. Additionally, the negative sign of the FL_DIVERSIFICATION variable suggests that those who know more about the financial diversification principles select less risky portfolios[‡]. Interestingly, FL_RISK, that together with FL_DIVERSIFICATION is the variable most related to the risk taking decisions, is not significant. The empirical implication of this result is quite

‡ The joint interpretation of this result with the findings of model (3) provides a possible explanation for this evidence.

dangerous as it indicates that the theoretical knowledge of risk is not relevant in determining the overall risk exposure of individuals. Thus, an investor decides how much risk to assume, regardless his/her knowledge about it. However, combining this finding with our descriptive data (see Table 2) showing that just the 2.88% of the respondents replies in the wrong way to the question about risk, we argue that our result could be affected by the low variability of answers.

Furthermore, the financial literacy levels influence also the way the individual risk attitude is related to the risk taken. Column (3) shows that the risk attitude is statistically significant and has a negative impact on portfolio risk. On the contrary, in the complete model shown in column (6), the variable is not significant. Only the interaction effect of individual risk attitude with financial literacy influences risk taking. This is an interesting result. Even though the respondents are called to indicate an asset allocation consistent with the risk profiles suggested in the questionnaire and not with their own risk attitude, their decisions are biased by a complex interplay of conscious and subconscious factors, including their own personal perception of risk. Therefore, we would expect that habitual patterns of behavior would affect the decision making process. This result suggests that our respondents override their biased perspectives on risk.

Focusing on the risk profile variable, column (4) and (6) show that it is significant and has a positive effect on the portfolio risk, in line both with theory and expectations.

Among the socio-demographic variables, marital status is statistically significant with a negative impact on the portfolio risk. There is no scientific literature specifically devoted to study the relation between this variable and the asset allocation, but we argue that it should play a role. A couple might better diversify everyday work and ordinary life risks, such as illness or accidents, and therefore could take more financial risks. However, our results do not confirm this hypothesis.

Table 6 and 7 report the results of models (3) and (4), that investigate the link between the financial literacy and the other dimension of risk, the diversification behavior. Specifically, Table 6 reports the results about the naive diversification behavior, while Table 7 reports the evidence about the sophisticated diversification. At odds with our expectations, overall these results suggest that the financial literacy of individuals does not influence in an evident way investors' diversification behavior.

Insert Table 6

Insert Table 7

However, as shown in column (6) of both tables, the financial literacy variables are weakly significant for the case of naive diversification, with a positive net effect (Table 6, column (6)). This

result is not surprising as, looking at the answers summarized in Table 2, the respondents seem not to know and understand well the diversification paradigm. *FL_DIVERSIFICATION* counts the greatest number of "I don't know" answers among the financial literacy variables (19.23%). The low relevance of this variable in our regression models is therefore motivated.

However, the positive and significant impact of the *FL_DIVERSIFICATION* variable on the Herfindhal index, in combination with the negative impact of the same variable on the overall portfolio risk (see Table 5), merits a further discussion. This finding indicates that individuals knowing the financial diversification paradigm apply it, at least in a naive way, reducing their portfolio risk. Therefore, investors, literate in terms of diversification, assume less risk because they diversify their portfolios, although in a naive way.

Furthermore, column (3) and (6) of Table 6 show that the risk attitude variable is positively significant when considered alone, but its joint effect with the financial literacy variables is weakly significant and negative. Investors, personally more willing to take risks, tend to concentrate their resources in a few assets, unless the investor is more financial literate. In this latter case, in fact, the joint effect of financial literacy and personal risk attitude pushes the diversification behavior towards a naive diversification strategy. This result does not hold in the sophisticated diversification case. Column (6) of Table 7 shows a negative effect of the risk attitude variable and just a weak positive interaction effect of it with one of the financial literacy variables. This result is at odds with the theory but, again, this evidence may depend on the fact that respondents are indicating asset allocations not based on their own risk profile, but for a fictitious individual. However, the empirical evidence does not support this interpretation since the risk profile of the fictitious individual has a negative impact both on the naïve diversification (Table 6) and on the diversification benefit (Table 7). These findings indicate that our respondents suggest to people more inclined to take risks to diversify more, but in a naïve way.

Overall, our findings show that the financial literacy may help investors to be bolder in exploiting the opportunities offered by financial markets (taking increasing amount of risks) and to use the properties offered by the financial theory, such as the diversification paradigm, although in its naïve form. This diversification strategy helps the literate investors to select a lower portfolio risk, because diversified in a more efficient way. As expected, the financial literacy does not affect the sophisticated approach to the diversification.

6. Conclusions

Every day people make investment decisions. This paper investigates whether the financial literacy

of individuals influences their risk taking process and their diversification behavior.

Prior literature has documented that financial illiteracy may be a problem of public interest, as investors are now called to be much more responsible for their financial security. The financial market has become a large shop of numerous and complex investment choices. Lusardi says that "It's like we've opened a faucet, and told people they can draw as much water as they want, and it's up to them to decide when they've had enough. But we haven't given people the tools to decide how much is too much".

Therefore, in order to support the investment process of investors, we have assisted, both at national and international level, to the rise of many financial education programs. However, it is important to understand if and how these programs can help individuals when deciding about their money.

Our study focuses on this aspect and investigates if not sophisticated investors take and diversify risk according to their level of financial literacy. In order to answer to this research question, we conducted a survey among 208 American individuals, recruited through Amazon Mechanical Turk.

We assume that this kind of decisions are typically made at two levels: one where investors must decide how much risk they are willing to take (i.e. they have to choose among more or less risky assets), and one where they can decide to exploit the diversification principles to reach the target level of risk.

In short, we show that financial literacy affects the amount of risk taken by individuals, but only partially the diversification strategies pursued.

Our findings report that more literate investors select riskier portfolios, but this effect is partially offset by their knowledge about financial diversification. Ordinary investors usually resort to simple heuristics to pursue diversification, such as the naive diversification, where wealth is split equally among securities. Our results show that people knowing the diversification principles assume less risk because they take advantage of the naïve diversification strategies.

Another interesting result is that, dangerously, the investors' financial knowledge about risk is not relevant to determine how much risk to assume, showing that they select a certain level of risk without knowing the meaning of risk itself.

On the whole, we argue that the financial literacy may help investors to be bolder in exploiting the opportunities offered by financial markets and to use the properties offered by the financial theory, such as the diversification paradigm, but only in the naïve form. In fact, the financial literacy does not affect more sophisticated diversification strategies. Therefore, as financial literacy affects positively the amount of risk taken by individuals, but only partially the diversification strategies pursued, there might be a dangerous pitfall in today's financial education programs, which, though they make investors more aware of their investment decisions, they eventually push them to assume

more risks than they are able to manage. Two possible ways to tackle this issue can be: 1) to boost the financial literacy of the investors so as to make them able to use all the investment techniques required by the standard theory. This, however, seems difficult to obtain; 2) to promote advisory activity among investors. This may help them to apply the diversification principle in a sophisticated way [Cavezzali, Rigoni, 2012].

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Tables

Table 1. Respondents' asset allocation decisions

Total	portfolio_risk	herfindhal	theoretical_risk	diversification_benefit	short	bond	blue chips	small caps	foreign
Mean	9.33%	36.43%	11.36%	0.26%	26.71%	25.35%	21.56%	13.72%	12.66%
Standard deviation	4.82%	19.2%	5.22%	0.31%	22.07%	20.54%	16.17%	11.89%	13.14%
Min	0.15%	20,00%	0.15%	-0.04%	0.00%	0.00%	0.00%	0.00%	0.00%
Max	23.74%	100,00%	24.06%	6.75%	100.00%	100.00%	100.00%	80.00%	100.00%
CAUTIOUS									
Mean	6.89%	40.83%	8.8%	0.31%	30.78%	35.17%	17.24%	8.73%	8.09%
Standard deviation	4.01%	20.26%	4.51%	0.2%	22.52%	23.61%	14.4%	9.08%	10.81%
Min	0.15%	20.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Max	20.92%	100.00%	22.11%	0.78%	100.00%	100.00%	100.00%	55.00%	100.00%
WELL-BALANCED									
Mean	8.92%	33.24%	11.02%	0.25%	27.79%	26.25%	20.17%	13.98%	11.82%
Standard deviation	4.12%	17.27%	4.57%	0.15%	20.51%	16.99%	12.72%	10.96%	11.79%
Min	0.15%	20.00%	0.15%	0,00%	0.00%	0.00%	0.00%	0.00%	0.00%
Max	22.69%	100.00%	23.82%	0.75%	100.00%	100.00%	75.00%	80.00%	100.00%
AGGRESSIVE									
Mean	10.56%	34.26%	12.66%	0.24%	24.67%	20.42%	23.73%	16.23%	14.97%
Standard deviation	4.74%	18.29%	5.08%	0.35%	21.61%	16.84%	16.6%	12.35%	13.63%
Min	0.15%	20.00%	0.15%	-0.04%	0.00%	0.00%	0.00%	0.00%	0.00%
Max	23.74%	10.00%	24.06%	6.75%	100.00%	100.00%	100.00%	80.00%	100.00%

Note: This table reports the overall decisions taken by our respondents in terms of asset allocation suggested to a fictitious friend: at the top of the table we find the average data of the total responses collected; moving down they are divided according to the fictitious friend's risk profile (cautious, moderate, aggressive). The dependent variables we used in our models are: portfolio risk, the Herfindahl index and the diversification benefit. Portfolio risk (*PORTFOLIO_RISK*) is measured as the standard deviation of each portfolio composed by our respondents, using the five asset classes offered in relation to the three risk profiles suggested. Each asset class (liquidity, bonds, large cap stocks, small cap stocks and foreign stocks) is fitted by a market index, used as a benchmark. Thus, we measure portfolio risk by calculating a variance-covariance matrix of daily returns over a 10-year time horizon for each benchmark and using as weights those chosen by respondents. HERFINDHAL and DIVERSIFICATION_BENEFIT take respectively into account the diversification behaviour of our respondents: the former accounts for naïve diversification strategies; the latter for sophisticated strategies. The first measure is defined as:

$$HERFINDHAL = \sum_{j=1}^{N} w_j^2$$

where w_j is the percentage invested in the asset class j. The index takes value 1 when the portfolio is invested only in one asset class, and value 1/N when the resources are split equally among the suggested asset classes.
The second measure captures the extent to which the imperfect correlation among asset classes reduces portfolio risk, given the weight structure of the suggested asset classes. We call this index *DIVERBEN* and it is defined as:

$$DIVERBEN = \frac{\sigma_{p/\rho=1}^2 - \sigma_p^2}{\sigma_{p/\rho=1}^2}$$

where $\sigma_{p/\rho=1}^2$ is the variance of portfolio returns when all correlations are set equal to 1 and σ_p^2 is the actual portfolio variance.
In our framework, as asset weights were always positive, the index takes values close to 0 when the correlations among asset classes are close to 1 and/or when the asset weights are heavily concentrated.

Table 2. Respondents' financial literacy level

	FL_interest rates		FL_inflation		FL_diversification		FL_risk		FL_lottery	
Correct	88.94%		78.37%		71.63%		89.9%		62.5%	
	40.87% (M)	*48.08% (F)*	*38.94% (M)*	*39.42% (F)*	*35.58% (M)*	*36.06% (F)*	*40.38% (M)*	*49.52% (F)*	*31.73% (M)*	*30.77% (F)*
Wrong	9.62%		16.35%		9.13%		2.88%		31.73%	
	2.88% (M)	*6.73% (F)*	*4.33% (M)*	*12.02% (F)*	*3.85% (M)*	*5.29% (F)*	*1.44% (M)*	*1.44% (F)*	*12.02% (M)*	*19.71% (F)*
I don't know	1.44%		5.29%		19.23%		7.21%		5.77%	
	1.44% (M)	*0% (F)*	*1.92% (M)*	*3.37% (F)*	*5.77% (M)*	*13.36% (F)*	*3.37% (M)*	*3.85% (F)*	*1.44% (M)*	*4.33% (F)*

Note: The 5 questions used to measure investors' financial literacy have been taken from the literature. In particular we monitor respondents' knowledge of: interest compounding (FL_interest rates); the effect of inflation on the purchasing power (FL_inflation); the diversification principle (FL_diversification); the riskiness of bonds versus stocks (FL_risk); again the notion of interest compounding in a more complex setting, i.e. lotteries with different characteristics

(FL_lottery). We modelled replies as dummy variables, taking value equal to 1 in case of right reply; 0 in case of wrong reply. "I don't know" were considered missing data.

Table 3. Respondents' personal information

	Respondents	Age	Education	Marital status						Occupation				
				Single	In a relationship	Married	Separated	Divorced	Widowed	Uemployed	Student	Employee	Self-employed	Retired
Total	208	37	4.66	37.02%	15.38%	36.54%	1.92%	6.73%	2.4%	16.35%	50.48%	18.75%	6.25%	8.17%
M	*45.19%*	*34*	*4.71*	*21.63%*	*7.69%*	*12.02%*	*0.48%*	*2.88%*	*0.5%*	*5.77%*	*28.37%*	*4.81%*	*1.92%*	*4.33%*
F	*54.81%*	*39*	*4.62*	*15.38%*	*7.69%*	*24.52%*	*1.44%*	*3.85%*	*1.92%*	*10.58%*	*22.12%*	*13.94%*	*4.33%*	*3.85%*

Note: In our models, the qualitative information regarding gender (*SEX*), job (*JOB*), marital status (*STATUS*) are codified as dummy variables. Age (*AGE*) is treated as a quantitative variable, while the education level (*EDUCATION*) is translated into a numeric scale, from 1 (lowest education level) to 7 (highest education level).

Table 4. Respondent's risk attitude

	Risk attitude		
	Adverse	Neutral	Lover
Total	17.79%	54.33%	27.88%
M	*11.54%*	*25,00%*	*8.65%*
F	*6.25%*	*29.33%*	*19.23%*

Note: In our models, the risk attitude (*RISK:ATTITUDE*) is translated into a numeric scale, respectively from 1 (risk aversion) to 3 (risk loving).

Table 5. Portfolio variance and financial literacy

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	PORTFOLIO_RISK	PORTFOLIO_RISK	PORTFOLIO_RISK	PORTFOLIO_RISK	PORTFOLIO_RISK	PORTFOLIO_RISK
FL_INTEREST RATE	0.325					4.778**
	(0.703)					(0.0263)
FL_INFLATION	0.582					6.752***
	(0.431)					(0.00115)
FL_DIVERSIFICATION	1.646*					-5.831**
	(0.0522)					(0.0156)
FL_LOTTERY	-0.554					-1.388
	(0.272)					(0.307)
FL_RISK	-1.564					-0.420
	(0.308)					(0.892)
RISKATT_INTERESTRATE		0.0651				-1.954*
		(0.859)				(0.0535)
RISKATT__INFLATION		-0.0199				-3.147***
		(0.951)				(0.00130)
RISKATT__DIVERSIFICATION		0.842**				3.490***

		(0.0265)				(0.00128)
RISKATT__RISK		-0.882*				-1.222
		(0.0875)				(0.527)
RISKATT__LOTTERY		-0.260				0.314
		(0.261)				(0.634)
RISK_ATTITUDE			-0.493*			2.242
			(0.0879)			(0.283)
RISK_PROFILE				2.643***		2.942***
				(0)		(0)
AGE					0.00751	0.0328
					(0.723)	(0.136)
SEX					0.432	0.469
					(0.286)	(0.312)
EDUCATION					0.0281	-0.00156
					(0.908)	(0.995)
NOT_EMPLOYED					-0.0668	-0.0735
					(0.935)	(0.938)
STUDENT					1.227*	1.465*
					(0.0530)	(0.0563)
EMPLOYEE					0.725	0.786
					(0.377)	(0.380)
SELF_EMPLOYED					0.0925	-0.816
					(0.941)	(0.565)
MARITAL_STATUS					-0.557	-1.135***
					(0.169)	(0.00602)
CONSTANT	9.201***	10.07***	10.36***	4.042***	8.261***	-1.434
	(5.63e-09)	(0)	(0)	(0)	(7.86e-10)	(0.689)
No. Obs.	441	441	624	624	624	441
R-squared	0.018	0.018	0.005	0.200	0.018	0.314

p-values in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the results of the regression between the portfolio risk and financial literacy, together with some interaction variables and some control variables. Column 6 shows the final specification of our first model, which is as follows:

$$PORTFOLIO\_RISK_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i$$

The *FIN_LITERACY* variable is a vector of the following five dummy variables: *FL_INTEREST RATE*, *FL_INFLATION*, *FL_DIVERSIFICATION*, *FL_RISK*, *FL_LOTTERY,* that are equal to 1 if the respondent's answer is correct, 0 otherwise. The "I do not know" answer is treated as missing value.

The qualitative information regarding sex (*SEX*), job (*JOB*), marital status (*STATUS*) are codified as dummy variables

as well. Age (*AGE*) is treated as a quantitative variable, while the risk attitude (*RISK_ATTITUDE*) and the education level (*EDUCATION*) of the respondent has been translated into a numeric scale, respectively from 1 (risk aversion) to 3 (risk loving) for risk attitude, and from 1 (lowest education level) to 7 (highest education level) for the education level. To capture the potential joint effect on the dependent variable of the financial literacy in association with the individual risk attitude, we also introduce some interaction variables between each of the five financial literacy dummies and the respondent's risk attitude. Thus, *FINLIT_RISK* is a vector of five interaction variables (*RISKATT_INTERESTRATE, RISKATT_INFLATION, RISKATT_DIVERSIFICATION, RISKATT_RISK, RISKATT_LOTTERY*).
As a control variable, we also insert in the regression the hypothetic risk profile suggested to the respondent (*RISK_PROFILE*).

Table 6. Naïve diversification strategies and asset allocation

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	HERFINDHAL	HERFINDHAL	HERFINDHAL	HERFINDHAL	HERFINDHAL	HERFINDHAL
FL_INTEREST RATE	-0.913					-17.07
	(0.786)					(0.126)
FL_INFLATION	-6.762**					-20.27*
	(0.0209)					(0.0693)
FL_DIVERSIFICATION	-5.306					22.01*
	(0.113)					(0.0831)
FL_LOTTERY	-1.806					11.04*
	(0.365)					(0.0669)
FL_RISK	-7.074					-5.913
	(0.244)					(0.641)
RISKATT_INTERESTRATE		1.737				6.790
		(0.236)				(0.199)
RISKATT__INFLATION		-1.627				6.491
		(0.209)				(0.225)
RISKATT__DIVERSIFICATION		-2.971**				-12.27**
		(0.0492)				(0.0387)
RISKATT__RISK		5.071**				-1.996
		(0.0138)				(0.815)
RISKATT__LOTTERY		-1.035				-5.627*
		(0.262)				(0.0737)
RISK_ATTITUDE			3.432***			7.862
			(0.00286)			(0.393)
RISK_PROFILE				-2.782***		-2.553**

				(0.00314)		(0.0225)
AGE					0.00226	0.0844
					(0.979)	(0.401)
SEX					0.0124	-1.316
					(0.994)	(0.523)
EDUCATION					-0.357	0.234
					(0.709)	(0.851)
NOT_EMPLOYED					7.662**	6.165
					(0.0299)	(0.160)
STUDENT					0.404	-1.013
					(0.879)	(0.781)
EMPLOYEE					2.981	-0.505
					(0.366)	(0.907)
SELF_EMPLOYED					6.207	7.952
					(0.242)	(0.292)
MARITAL_STATUS					2.511	4.791***
					(0.110)	(0.00545)
CONSTANT	55.97***	32.74***	29.24***	42.01***	34.32***	40.03**
	(0)	(0)	(0)	(0)	(1.01e-10)	(0.0114)
No. Obs.	441	441	624	624	624	441
R-squared	0.043	0.027	0.014	0.014	0.027	0.150

p-values in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the results of the regression between possible naïve diversification strategies (measured by the Herfindhal index) and financial literacy, together with some interaction variables and some control variables. Column 6 shows the final specification of our second model, which is as follows:

$$HERFINDHAL_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i$$

For a complete description of the variables, see the previous table.

Table 7. Sophisticated diversification strategies and financial literacy

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	DIVER_BENEFIT	DIVER_BENEFIT	DIVER_BENEFIT	DIVER_BENEFIT	DIVER_BENEFIT	DIVER_BENEFIT
FL_INTEREST RATE	0.0679					-0.271

	(0.269)					(0.158)
FL_INFLATION	-0.0479					-0.0553
	(0.369)					(0.763)
FL_DIVERSIFICATION	-0.162***					0.227
	(0.00817)					(0.363)
FL_LOTTERY	0.0206					-0.102
	(0.571)					(0.127)
FL_RISK	0.150					-0.261
	(0.175)					(0.316)
RISKATT_INTERESTRATE		0.0319				0.149
		(0.225)				(0.158)
RISKATT__INFLATION		-0.0225				0.0141
		(0.334)				(0.905)
RISKATT__DIVERSIFICATION		-0.0846***				-0.181
		(0.00189)				(0.290)
RISKATT__RISK		0.0825**				0.227
		(0.0258)				(0.208)
RISKATT__LOTTERY		0.0159				0.0596*
		(0.338)				(0.0911)
RISK_ATTITUDE			0.0169			-0.224**
			(0.360)			(0.0286)
RISK_PROFILE				-0.0475***		-0.0525**
				(0.00164)		(0.0287)
AGE					0.000931	0.000444
					(0.621)	(0.840)
SEX					-0.0278	-0.0214
					(0.168)	(0.247)
EDUCATION					-0.00767	0.000810
					(0.525)	(0.936)
NOT_EMPLOYED					0.0202	-0.0332
					(0.684)	(0.495)
STUDENT					-0.0273	-0.0743
					(0.229)	(0.123)
EMPLOYEE					-0.0415	-0.0619
					(0.240)	(0.269)
SELF_EMPLOYED					-0.103	-0.159**
					(0.137)	(0.0295)

MARITAL_STATUS					0.00398	-0.0106
					(0.888)	(0.689)
CONSTANT	0.235**	0.219***	0.226***	0.357***	0.298***	0.804***
	(0.0354)	(2.07e-05)	(4.43e-08)	(0)	(3.07e-10)	(2.99e-05)
No. Obs.	439	439	622	622	622	439
R-squared	0.025	0.040	0.001	0.016	0.011	0.073

p-values in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the results of the regression between possible sophisticated diversification strategies (measured by the diversification benefit index) and financial literacy, together with some interaction variables and some control variables. Column 6 shows the final specification of our second model, which is as follows:

$$DIVERBEN_i = \alpha + \beta_1 FIN\_LITERACY_i + \beta_2 SEX_i + \beta_3 JOB_i + \beta_4 STATUS_i + \beta_5 EDUCATION_i + \beta_6 AGE_i + \beta_7 RISK\_ATTITUDE_i + \beta_8 FINLIT\_RISK_i + \beta_9 RISK\_PROFILE_i + \varepsilon_i$$

For a complete description of the variables, see Table 5.

Appendix

Questionnaire[§]

We are a group of research in Behavioural Finance. We want to study how people deal with the investment activity. In this context we are especially interested in your choices given the current market situation. Please take your time to carefully go through the following instructions and then reply.

PART 1: THE ASSET ALLOCATION DECISION

Imagine you have a friend whose profile is described as follows:

He has just got his MBA. He is 26 years old, single and does not own any real estates or other wealth. Shortly, however, he will inherit USD 350,000 from his deceased grandmother. He has just accepted his first job offer a few weeks ago (net income: USD 30,000). He wants to invest this money but he doesn't have any particular objective for his investment, except that he may need part of the money in one year for a new car or in five years for a house.

Now imagine that your friend describes his risk attitude with the following words:

[PROFILE A: CAUTIOUS[**]]

"I am CAUTIOUS. As an MBA-graduate I know that risky assets are supposed to have higher returns, but I couldn't bear to "gamble" with my grandma's savings. Definitely I am willing to invest part of the capital in stocks and I am willing to accept a possible loss of – say – 10% in a year. But after 10 years I should at least be left with my 350,000 and some interest".

Assume that the following investment alternatives are available:

- ***Short-term:*** *interest-paying investments such as money market funds, cash accounts, short-term bonds with maturity up to 1 year;*
- ***Bonds:*** *interest-paying investments with maturity 5 to 20 years such as high-quality bonds or corresponding bond-funds;*
- ***Blue Chips:*** *large capitalization US stocks, such as those belonging to the S&P500 index or mutual funds investing in these stocks;*
- ***Small Caps:*** *small capitalization US stocks that do not belong to the S&P500 index or corresponding mutual funds;*
- ***Foreign stocks:*** *a mixture of foreign Blue Chips, Small Caps and mutual funds of foreign stocks.*

[§]The questionnaire, in its first part, presents a structure taken from Siebenmorgen, Weber (2003).

[**] The 3 risk profiles di rischio (cautious, well-balanced, aggressive) have been presented in a random ordering while submitting the questionnaire.

Historically, short-term investments and bonds are considered less risky investments, whereas all the investments in stocks (national and foreign) are riskier but on average they can guarantee higher earnings.

How would you suggest to invest his money for the next 12 months?

Please insert percentages (numbers from 0 to 100) in the empty boxes below. You can decide to allocate your money as you prefer, even putting all of it in one of the alternatives. THE SUM OF THE PERCENTAGES MUST ***ADD UP TO 100%.***

Short-term

Bonds

Blue Chips

Small Caps

Foreign stocks

Total

[PROFILE B: MODERATE]

Now imagine that your friend describes his risk attitude with the following words:

"Please offer me a WELL BALANCED investment strategy, to invest these USD 350,000. The strategy should have potentials for growth and gains without being too risky. As a result I am completely aware that a possible drawback of the markets might produce a portfolio performance of -20% in one year, which is hard to make up for. That's OK. But please be careful that the portfolio risk is not too big".

Assume that the following investment alternatives are available:

- ***Short-term****: interest-paying investments such as money market funds, cash accounts, short-term bonds with maturity up to 1 year;*
- ***Bonds****: interest-paying investments with maturity 5 to 20 years such as high-quality bonds or corresponding bond-funds;*
- ***Blue Chips****: large capitalization US stocks, such as those belonging to the S&P500 index or mutual funds investing in these stocks;*
- ***Small Caps****: small capitalization US stocks that do not belong to the S&P500 index or corresponding mutual funds;*
- ***Foreign stocks****: a mixture of foreign Blue Chips, Small Caps and mutual funds of foreign stocks.*

Historically, short-term investments and bonds are considered less risky investments, whereas all the investments in stocks (national and foreign) are riskier but on average they can guarantee higher earnings.

How would you suggest to invest his money for the next 12 months?

Please insert percentages (numbers from 0 to 100) in the empty boxes below. You can decide to allocate your money as you prefer, even putting all of it in one of the alternatives. THE SUM OF THE PERCENTAGES MUST ***ADD UP TO 100%.***

Short-term

Bonds

Blue Chips

Small Caps

Foreign stocks

Total

[PROFILE C: AGGRESSIVE]

Now imagine that your friend describes his risk attitude with the following words:

"As I have never dreamed of these USD 350,000, I DO NOT MIND POSSIBLE LOSSES! I ask you to invest this money in a way that it will seize very good opportunities for potential gains. Of course I do not want to gamble with this money, but I am willing to accept the high risk of an aggressive and opportunity-taking investment strategy, which makes sense for the moment. So I hope to generate a high income with this inheritance".

Assume that the following investment alternatives are available:

- ***Short-term****: interest-paying investments such as money market funds, cash accounts, short-term bonds with maturity up to 1 year;*
- ***Bonds****: interest-paying investments with maturity 5 to 20 years such as high-quality bonds or corresponding bond-funds;*
- ***Blue Chips****: large capitalization US stocks, such as those belonging to the S&P500 index or mutual funds investing in these stocks;*
- ***Small Caps****: small capitalization US stocks that do not belong to the S&P500 index or corresponding mutual funds;*
- ***Foreign stocks****: a mixture of foreign Blue Chips, Small Caps and mutual funds of foreign stocks.*

Historically, short-term investments and bonds are considered less risky investments, whereas all the investments in stocks (national and foreign) are riskier but on average they can guarantee higher earnings.

How would you suggest to invest his money for the next 12 months?

Please insert percentages (numbers from 0 to 100) in the empty boxes below. You can decide to allocate your money as you prefer, even putting all of it in one of the alternatives. THE SUM OF THE PERCENTAGES MUST ***ADD UP TO 100%.***

Short-term

Bonds

Blue Chips

Small Caps

Foreign stocks

Total

PART 2: THE RESPONDENTS' FINANCIAL LITERACY

We can now move to the second part of this study. We kindly ask you to reply to the following few questions.

a) Suppose you have $100 in a savings account and the interest rate is 2 percent per year. After 5 years, how much do you think you will have in the account if you leave the money to grow: more than $102, exactly $102, less than $102?

- More than $102
- Exactly $102
- Less than $102
- I don't know.

b) Imagine that the interest rate on your savings account was 1 percent per year and inflation was 2 percent per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

- More than today
- Exactly the same as
- Less than today
- I don't know

c) Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.

- True
- False
- I don't know

d) Do you think that the following statement is true or false? Bonds are riskier than stocks.

- True
- False
- I don't know.

e) Suppose you have just won $1 million in a lottery. What do you do?

- You take all the money immediately
- You take $100.000 each year for ten years
- I don't know

PART 3: THE RESPONDENTS' DEMOGRAPHICS

We are nearly done! This is the last part of our study. We would be very grateful if you could provide some personal information.

a) Could you indicate your gender?

- M
- F

b) Could you indicate your age (in numbers)?

……

c) Which is your nationality?

…….

d) Which is your education level?

- None
- Elementary school
- Middle school
- High school
- Bachelor (indicate below the number of courses in finance)
  ……
- Master degree (indicate below the number of courses in finance)
  ……
- Doctoral degree (indicate below the number of courses in finance)
  ……

e) Which is your marital status?

- Single
- In a relationship/Engaged
- Registered partnership
- Married and living together with spouse
- Married, living separated from spouse
- Divorced
- Widowed

f) Which is your employment status?

- Not employed
- Student
- Employee
- Self-employed
- Retired

g) Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments?

- Take above average financial risks expecting to earn above average returns
- Take average financial risks expecting to earn average returns
- Not willing to take any financial risks.

CONCLUSION

We thank you very much for participating in this research!

Your data will be processed shortly and payments will be completed as soon as possible.

Please remember to copy and paste the Qualtrics ID showing in the next window onto the box on Mechanical Turk.