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Temporal Stability of Risk Preference Measures

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Abstract

We examine the temporal stability of risk preference measures obtained by different elicitation methods in a controlled laboratory experiment at two distinct times. Our results indicate remarkable temporal stability of risk measures at the aggregated level and temporal instability at the individual level. We control for the impact of, first, personality traits, and second, performance realized in a market game. When better market performers demonstrate more stable risk preferences, the impact of personality traits is marginal.

Keywords: Time stability, Risk Preferences, Personality Theory, Experimental economics
JEL codes: C9, D8, D9

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1 Introduction

In economic theory, risk preferences play an important role in understanding behavioral differences observed between individuals (e.g. health and investment portfolios (Barsky et al., 1997) or occupational choice (Bonin et al., 2007)). Consequently, the question of temporal stability of risk preferences is important for the resolution of, first, economic theories under uncertainty and, second, public policies that are based on the assumption about agents' risk degrees. The elicitation of risk preferences and their utilization largely rests on the assumption that risk preferences are stable over time (e.g. Andersen et al. (2008a) and Andersen et al. (2008b)).

A growing body of literature has explored to what extent individual risk preferences are temporally stable. Overall, results demonstrate a general tendency of temporal stability at the aggregated level. Brunnermeier and Nagel (2008) and Malmendier and Nagel (2011) examined the risk preference stability with panel-study data from the field. The stability of constant relative risk aversion (CRRA) parameter was investigated by Wehrung (1984) analyzing the preference of business executives with a 1-year interval. Harrison et al. (2005) tested the CRRA by using the Holt and Laury (2002)'s procedure over a period of 5-6 months. Further, the stability of the CRRA parameter was studied by Goldstein et al. (2008) by using a fictious retirement saving scenario. Smidts (1997) analyzed temporal stability of risk attitudes over one year using the certainty equivalent method. Sahm (2007) have demonstrated an important stability of hypothetical self-attributing questions. Recently, Zeisberger et al. (2012) focused on the stability of prospect theory parameters. While documenting remarkable stability of parameter estimates at the aggregate level, they found significant instability over time at the individual level.

This study extends the existing literature on temporal stability of risk preferences. To analyze the temporal stability of risk preference measures, we consider the impact of personality traits and the relative performance realized in a market game. Recently, scholars have begun to integrate personality into economic decision making and have demonstrated that personality plays a powerful role in predicting life outcomes[1]. Personality theory can be viewed as a theory of fundamental psychological structure determining human behavior (Costa and McCrae, 1992). It studies patterns of cognition, emotion and behavior that are relatively stable over time and across situations (Borghans et al., 2008). There is now wide agreement on the five major dimensions of personality at the broadest level: Openness to experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism (OCEAN). The Five-Factor Personality Inventory Test introduced by Costa and McCrae (1992) is nowadays the most widely used system of classification for personality traits. The score of an individual in these five dimensions is believed to characterize her stable pattern of thoughts and feelings, and

[1] e.g. Anderson et al. (2011), Borghans et al. (2011), Roberts et al. (2007) and Almlund et al. (2011) conclude that personality traits can predict important life outcomes and have even stronger predictive power than economic preferences.

can be used to predict her behavior (e.g. DeYoung and Gray (2009), Rustichini (2009) and Roberts et al. (2007)). Regarding the link between risk preferences and the Big Five measures Dohmen et al. (2010) indicate significant relationships between risk preferences and openness to experience and agreeableness. Anderson et al. (2011) report a weak correlation between risk preference and neuroticism. Nicholson et al. (2005) have observed that extraversion and openness supply were linked with more larger risk taking.

To accomplish our objective, 183 subjects participated to an experiment organized in two sessions separated by a week interval. A near-at-hand method for analyzing issues of temporal stability is to ask the same set of subjects to provide statements for the same questions at different points of time. Are risk measures stable? Can personality traits help to explain the temporal stability of risk preferences? Does individual performance matter for the stability of risk preferences? Existing literature has also demonstrated that individual risk preferences differ in respect to the used elicitation method and are task and context dependent (e.g. Weber et al. (2002) and Isaac and James (2000)). For this reason we use five different elicitation methods and investigate which elicitation method is the most more reliable.

Our results support the findings in Zeisberger et al. (2012). We observe stability of risk measures at the aggregate level: Subjects who expressed a low(high) risk preference in Week 1 are those who expressed a low (high) risk preference in Week 2. At the individual level, we observe that the degree of risk aversion has significantly increased between Week 1 and Week 2. Regarding the individual relative performance, we find that better market performers demonstrate more stable risk preferences. Personality traits explain only marginally temporal stability of risk preferences.

The experimental design is described in the next section, followed by the results. The final section discusses our results.

2 Experimental Design

Data reported in this paper were gathered in an experiment organized in two sessions separated by one week interval. During the first session subjects completed a behavioral questionnaire that elicited individual risk preferences and personality traits. Individual risk preferences were elicited in a pen-and-pencil questionnaire, followed by computer-based personality traits questionnaire including demographic questions. The second session took place a week later. Here, subjects answered a replication of the risk preference questionnaire from session 1 after having participated to a computerized experimental asset market game (Smith et al., 1988) whose results are reported in Strážnická (2012). Instructions to elicit risk preferences provided to subjects are in the Appendix.

2.1 Questionnaire

2.1.1 Risk Preference Measures

All subjects received a similar questionnaire in which risk preferences were measured in the same order. The first four risk preference measures use hypothetical questions[2], the last one uses real monetary incentives. The measures were elicited as follows: *Perception of a Risky Lottery (RL)*: Subjects were presented a gamble question, represented by a lottery that costs 10,000 Euro and pays out either 13,000 Euro or 10,100 Euro, each with 50% probability. Subjects were asked to state their risk perception of this lottery on a Likert-scale from 0 to 10 where 0 indicates that the lottery is perceived as a risk-free and 10 indicates that the lottery is perceived as very risky. In the rest of the paper, we refer to the obtained score as to "RL". *Risk Taking (RT)*: Subjects made an investment decision between the lottery introduced in the previous task and a risk-free asset that pays a certain dividend with a 5% interest rate. The score "RT" takes the value 0 if the subject invests the whole amount into the risk free asset and 100 if she invests only into the lottery. *Certainty Equivalent (CE)*: Certainty equivalence method measured individual risk preferences by repeatedly asking subjects whether they would prefer to participate in a lottery or to receive a sure payment of x Euro, with x ranging from 1,000 Euro to 9,000 Euro. *Survey Question (SQ)*: Participants rate their willingness to take risk in financial decisions on a scale from 0 to 5 where "0=very low willingness" and "5=very high willingness"[3]. *Multiple price list method (HL)*: Holt and Laury (2002) devise an experimental measure for risk aversion using a multiple price list design. Each subject is presented with a choice between two paired lotteries, which can be called "A" or "B". In our experiment, the payoffs for the lottery "A" are either 8 Euro or 6.4 Euro. The riskier lottery B pays either 15.4 Euro or 0.4 Euro. Subjects are asked to make ten decisions and choose one lottery for each pair. The ten decisions have similar payoffs, however, moving down the table, the probability of the high-payoff outcome gradually increases. At the end, one decision is randomly chosen by a roll of a ten-sided dice to determine participant's earnings. The outcome of the selected lottery is determined by a second random draw at the end of the experiment. The total number of safe choices determines individual risk preference.

2.1.2 Personality Traits

To elicit individual personality traits we used the 60-item French version of the questionnaire (Rolland et al., 1998). Questions are presented alternatively in positive and negative phrasing. Answers are based on voluntary self-assessment. Subjects declare on five-scale Likert-type scale whether they agree or disagree with each proposition.

[2]For example, Wärneryd (1996) concludes that questions involving hypothetical risky choices seem to work quite well.

[3]This question makes a direct link with practice in investment advice that uses this classification method as common practice. In addition, subjective risk attitudes on Likert scales are also used in large scale surveys such as the Socio-Economic-Panel (SOEP) (see Dohmen et al. (2011)).

2.2 Procedure and Subject Pool Descriptive Statistics

2.2.1 Procedure

When recruited, subjects were informed that the experiment will consist of two sessions with a week break in between, that their presence to both sessions is necessary and that payments for both sessions will be received at the end of the second session. Subjects enrolled to both sessions before their participation to the first session. Data were gathered at the laboratory of the Gate, Lyon, France, using the subject pool from local business and engineering graduate schools. 183 subjects were recruited via the ORSEE software (Greiner, 2004). The computerized parts of the experiment were programmed with the z-Tree software (Fischbacher, 2007). The two sessions altogether lasted about three hours and a half. Subjects earnings in the whole experiment, including the show-up fee, averaged 45€.

2.2.2 Descriptive Statistics

Table 1 summarizes the descriptive statistics of the subject pool. Overall, 183 subjects participated to both experimental sessions[4], of which 88 are males. The average age is almost 22 years. For the personality traits measures, we use the T-score normalized values[5]. They should be interpreted as the higher the score, the more pronounced the personality trait is.

Table 1: Descriptive Statistics of Subject Pool

	Mean	Median	STDV
Gender (1=Male)	0.48		
Age	21.93	21	4.72
Neuroticism	50.22	51	10.12
Extraversion	49.62	51	9.79
Openness	50.05	51	9.97
Agreeableness	50.05	50	10.20
Consciousness	50.42	51	9.91
Nb of Observations	183		

3 Results

Table 2 reports the descriptive statistics of the five risk measures. In order to facilitate their interpretation, we converted them so that they are of comparable size and that

[4]Overall, 203 subjects participated to the first session but 20 subjects did not show up at the second session. Econometric analysis does not indicate any specific characteristics of this group. Those who did not participate to both sessions were eliminated from our analysis on stability of risk preferences.

[5]T-score normalized values of each personality trait are calculated separately for males and females as:

$$\text{individual value} - (\text{mean})/\text{standard error} * 10 + 50$$

.

they should be interpreted as the higher the score, the more risk averse an individual is. We compare the distribution of risk preference measures between the first and the second week using the Wilcoxon sign-rank test and the Spearman correlation. The Spearman's ρ test counts the correlation between risk measures elicited in Week 1 and in Week 2 and reports whether the preference ranking, the order given by the measures, is the same. This allows us to say whether there is a stability in the preference ranking between Week 1 and Week 2 at the aggregated level. We observe an important stability of risk measures between Week 1 and Week 2: Individuals who expressed a low(high) risk preference in Week 1 are those who expressed a low (high) risk preference in Week 2. The Wilcoxon sign-rank test indicates that, at the individual level, the degree of risk aversion has significantly increased between Week 1 and Week 2 (except for the "SQ" measure).

Table 2: Descriptive Statistics of Risk Measures

Risk Measure	mean	sd	p50	max	min	z	ρ
HL (W1)	6.78	1.78	7	10	2	-2.399**	0.579***
HL (W2)	7.10	1.67	7	11	3		
RL (W1)	2.02	1.57	1	8	1	-2.076**	0.721***
RL (W2)	2.22	1.57	2	9	1		
RT (W1)	2.09	2.40	1	10	0	-2.862***	0.674***
RT (W2)	2.60	2.47	2	10	0		
CE (W1)	5.60	1.51	6	10	1	-8.396***	0.400***
CE (W2)	6.73	1.38	7	10	2		
SQ (W1)	3.63	1.08	4	6	1	-1.105	0.822***
SQ (W2)	3.67	0.99	4	6	1		

Note: z of Wilcoxon sign-rank test. ρ of Spearman rank correlation. $***$ indicates significance at the 0.001 level, $**$ at the 0.05 level, $*$ at the 0.10 level.

Figure 1 reports the evolution of individual risk preferences between Week 1 and Week 2. Overall, we observe an important temporal stability of risk measures at the aggregated level. At the individual level, a majority of subjects has increased its level of risk aversion.

Figure 1: Evolution of Individual Risk Preference Measures

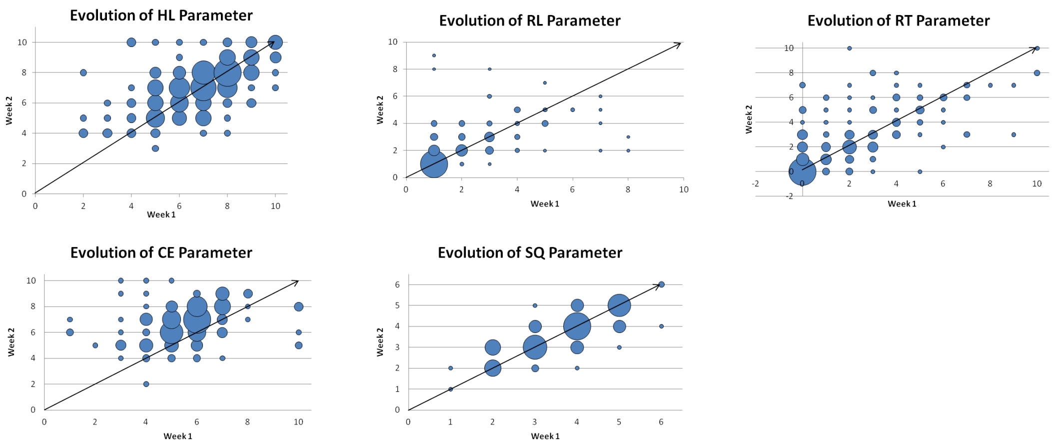

Table 3 shows the distribution of the preference shift by measure, calculated as the absolute difference between the degree of risk aversion in Week 1 and in Week 2. The last line summarizes the percentage of subjects who made the same choice in both sessions or switched by plus/minus one. We observe that the "RL" and "SQ" measures are the most stable, as 84%, respectively 98%, of subjects made the same choice or only switched by plus or minus one point.

Table 3: Distribution of Preference Shift

Preference shift	HL	RL	RT	CE	SW
0	34%	60%	42%	14%	68%
$\|1\|$	40%	24%	25%	44%	30%
$\|2\|$	15%	8%	15%	26%	2%
$\|3\|$	7%	4%	7%	9%	
$\|4\|$	1%	0%	4%	2%	
$\|5\|$	1%	2%	4%	2%	
sup $\|5\|$	2%	2%	3%	3%	
(0,± 1)	74%	84%	67%	58%	98%

3.1 Econometric analysis

In this section, we estimate the determinants of temporal stability of risk preferences by means of Probit models in which robust standard errors are clustered at the session level[6]. We use the preference shift as the dependent variable. For the analysis of the first four risk measures, the dependent variable is a dummy variable equal to 1 if a subject made the same choice or switched by plus/minus one between Week 1 and Week 2. If dependent dummy variable equals 1, we consider risk preferences stable. As for the "SQ" measure, we consider only similar choices as temporally stable due to the lack of heterogeneity in our data. Therefore, the dependent dummy variable equals 1 if a subject made the strictly same choice in both Week 1 and Week 2. To address our research question about the influence of individual characteristics on the temporal stability of risk preferences, the independent variables include the T-scores of personality traits, age and gender. Table 4 reports the results.

Our results indicate that the temporal stability of risk preferences is not correlated with personality traits, age and gender. As for the impact of personality traits, openness and its impact on the "HL" and "CE" measures is statistically significant. As the signs associated with the coefficients are opposite, we cannot conclude about the direction of the impact. Moreover, neuroticism has negative statistically significant impact on the "RT" measure suggesting that those with lower neuroticism score are more stable in "RT" task.

Further, we examine the impact of individual relative performance on the stability of risk preferences. The individual relative performance is defined as the individual

[6] Clusters at the session level are considered according to the participation to the market experiment organized in Session 2.

Table 4: Determinants of Risk Preference Stability: Probit model

Dependent Variable: Reference Shift	HL	RL	RT	CE	SQ
Male	-0.138	-0.211	0.307	0.121	0.143
	(0.220)	(0.287)	(0.246)	(0.120)	(0.173)
Openness (T-score)	0.016**	-0.001	-0.002	-0.016*	0.009
	(0.008)	(0.011)	(0.009)	(0.010)	(0.010)
Consciousness (T-score)	0.009	-0.016	0.006	-0.006	0.001
	(0.011)	(0.011)	(0.009)	(0.007)	(0.011)
Extraversion (T-score)	-0.013	0.025*	0.003	-0.002	0.004
	(0.011)	(0.013)	(0.009)	(0.009)	(0.012)
Agreeableness (T-score)	-0.012	-0.013	-0.004	-0.005	0.002
	(0.013)	(0.012)	(0.010)	(0.012)	(0.008)
Neuroticism (T-score)	-0.007	0.003	-0.023**	-0.003	-0.003
	(0.011)	(0.011)	(0.011)	(0.007)	(0.010)
Age	-0.006	-0.245**	0.144*	-0.014	-0.976
	(0.113)	(0.119)	(0.084)	(0.093)	(1.131)
Age^2	-0.001	0.003**	-0.002**	0.000	0.022
	(0.001)	(0.001)	(0.001)	(0.001)	(0.025)
Constant	1.485	5.105**	-1.474	1.747	10.696
	(1.975)	(2.163)	(1.855)	(1.838)	(12.478)
N	183	183	183	183	183
Wald chi^2	15.44	17.70	14.17	5.86	2.26
$Prob>chi^2$	0.051	0.024	0.077	0.663	0.972
Pseudo R^2	0.048	0.061	0.045	0.016	0.024
log pseudo-likelihood	-99.218	-75.059	-117.584	-122.528	-112.250
Clusters	21	21	21	21	21

Note: Standard errors clustered at the session level in parentheses. $*\,*\,*$ indicates significance at the 0.001 level, $**$ at the 0.05 level, $*$ at the 0.10 level.

performance realized during the market game in comparison with other subjects participating to the same market. Table 5 reports the results of these probit regressions.

When controlling for the individual relative market performance, we observe that better market performers are characterized by more stable risk preferences. This finding indicates that a poor market performance influences the perception of risky stakes: bad performers consider uncertain situations more risky.

Finally, one may also ask about the impact of other market variables, such as individual trading activity[7] and bubble experience[8]. We did not find any correlation between individual trading activity or bubble occurrence and temporal stability of risk preferences. Results are shown in Tables 6 and 7 in the Appendix.

[7]Defined as the ratio of concluded transactions by a subject on the total number of transactions realized during a market.

[8]We consider a bubble occurrence as defined in Noussair et al. (2001).

Table 5: Relative Performance: Probit regression

Dependent Variable: Reference Shift	HL	RL	RT	CE	SQ
Male	-0.217	-0.350	0.246	0.166	0.102
	(0.236)	(0.295)	(0.259)	(0.127)	(0.163)
Openness (T-score)	0.016**	-0.000	-0.003	-0.015	0.009
	(0.008)	(0.011)	(0.009)	(0.010)	(0.010)
Consciousness (T-score)	0.015	-0.008	0.009	-0.008	0.003
	(0.012)	(0.012)	(0.009)	(0.007)	(0.011)
Extraversion (T-score)	-0.013	0.027*	0.003	-0.002	0.004
	(0.011)	(0.014)	(0.009)	(0.009)	(0.012)
Agreeableness (T-score)	-0.013	-0.016	-0.004	-0.005	0.002
	(0.012)	(0.011)	(0.009)	(0.012)	(0.008)
Neuroticism (T-score)	-0.007	0.005	-0.023**	-0.003	-0.003
	(0.011)	(0.011)	(0.011)	(0.008)	(0.011)
Age	0.019	-0.202*	0.143*	-0.014	-1.106
	(0.117)	(0.111)	(0.087)	(0.094)	(1.059)
Age^2	-0.001	0.003*	-0.002*	0.000	0.025
	(0.001)	(0.001)	(0.001)	(0.001)	(0.024)
Relative Performance	0.212***	0.416***	0.157	-0.103	0.108
	(0.068)	(0.098)	(0.102)	(0.106)	(0.124)
Constant	0.660	3.540*	-1.758	1.951	11.867
	(2.164)	(1.836)	(1.874)	(1.835)	(11.809)
N	183	183	183	183	183
Wald chi^2	28.40	37.26	22.37	6.57	5.37
Prob>chi^2	0.001	0.000	0.008	0.681	0.801
Pseudo R^2	0.068	0.130	0.055	0.021	0.030
log pseudo-likelihood	697.153	-69.569	-116.351	-121.960	-111.623
Clusters	21	21	21	21	21

Note: Standard errors clustered at the session level in parentheses. ∗∗∗ indicates significance at the 0.001 level, ∗∗ at the 0.05 level, ∗ at the 0.10 level.

4 Conclusion

In this paper we examine the impact of personality traits and individual market performance on the temporal stability of risk preference measures. We considered five different elicitation methods. In line with existing literature, we observe important temporal stability of risk measures at the aggregate level. At the individual level, subjects have become more risk averse. Controlling for personality traits, we find little support for linking the stability of risk preferences with personality traits. When the impact of individual market performance is considered, we find that better market performers demonstrate more stable risk preferences. Possible explanation could be that poor performers are disappointed which makes them consider risky situations in more conservative manner. Overall, we have observed the highest stability of the self-reported survey question measure. This goes in line with Dohmen et al. (2011) who have reported that survey question measure is a reliable predictor of risk attitudes.

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5 Appendix

5.1 Instructions

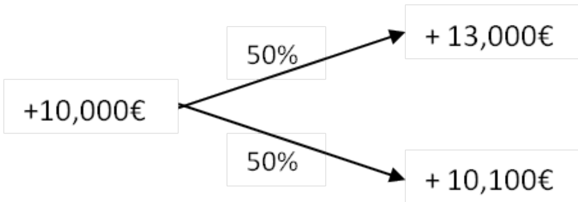
The experiment starts with a computer-based questionnaire to elicit personality traits (the Five-Factor Personality Inventory Test (Costa and McCrae, 1992)). The paper-based questionnaire follows.

Paper-based Questionnaire
Part I
Some Questions Concerning your Attitude toward Risk

In the following questionnaire, we would like to ask you to evaluate the riskiness of given situations. There are no correct or wrong answers. We are interested in finding out more about your personal preferences and attitudes with regard to the various alternatives.

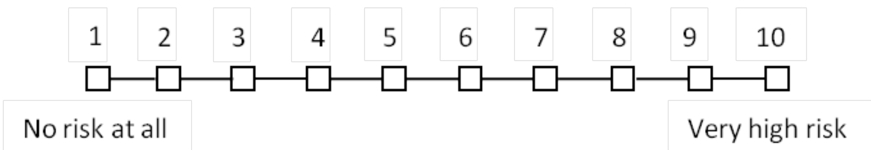
1. **Consider the following situation:**

   (a) Question 1
   You have an initial wealth of 10,000 Euro, which could be invested in a risky investment. Your wealth could either increase to 13,000 Euro or increase only to 10,100 Euro, each with a probability of 50%.



Risky investment

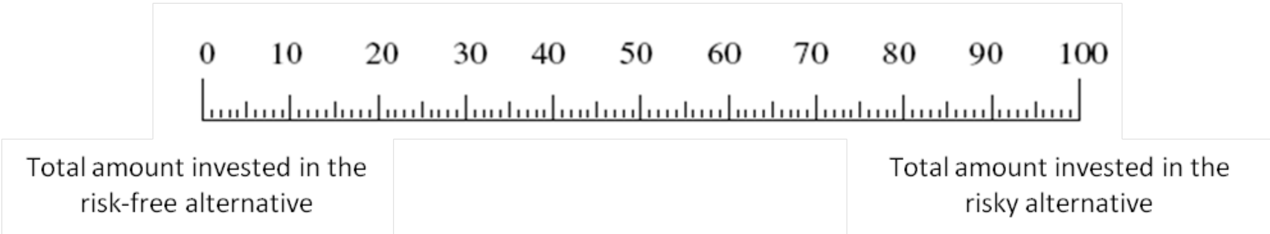
   How do you assess the risk of the aforementioned risky investment on a scale from 1 (no risk at all) to 10 (very high risk)?



   (b) Question 2
   Another option is you can also invest the 10,000 Euro in a risk-free alternative with safe 5% interest rate.

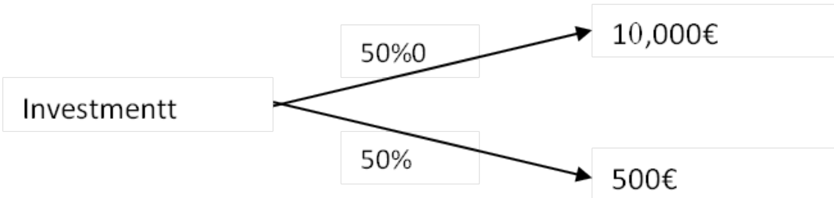
Consider the following scenario: You could invest your initial wealth of 10,000 Euro in either the risky investment or in the risk-free asset. How much would you invest in the risky investment and in the risk-free investment, respectively?

Please, mark your answer on the following scale from 0 to 100, where 0 indicates that the full amount will be invested in the risk-free alternative and 100 indicates that the full amount will be invested in the risky alternative.

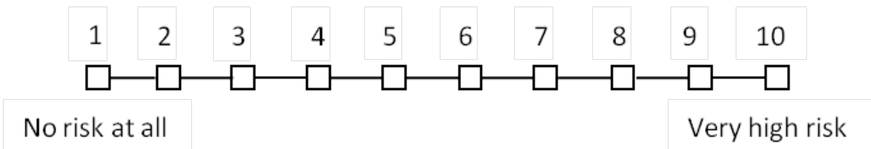


In the following situation, you can again choose between a risky alternative and a risk-free alternative

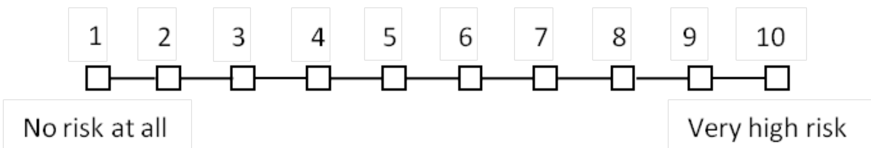
(a) Question 1
The risky investment either returns you an amount of 10,000 Euro or it returns an amount of 500 Euro.



How do you assess the risk of the aforementioned risky investment on a scale from 1 (no risk at all) to 10 (very high risk)?

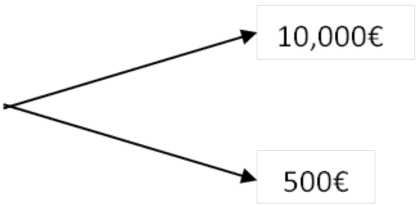


How do you assess the risk of the aforementioned risky investment on a scale from 1 (no risk at all) to 10 (very high risk) if you get additional 4,000 Euro for sure?



(b) Question 2

Now the amount you could alternatively get if you pick the risky alternative (lottery), will vary from 500 Euro to 10, 000 Euro. Please mark for each amount whether you would prefer the participation in the lottery or the risk-free alternative.

Lottery	Risk-free amount	I prefer the lottery	I prefer the risk-free amount
	9,000€ 8,000€ 7,000€ 6,000€ 5,000€ 4,000€ 3,000€ 2,000€ 1,000€		

Part 3

We present you a set of 10 decisions to make in the table below. Each decision is a paired choice between two options: "Option A" and "Option B". You will make ten choices and record them in the column on the right side. Only one of your choices will be used in the end to determine your final earnings for this part of questionnaire. This earning will be added to your final earnings.

We use a ten-sided die for determining the payoffs. The faces are numbered from 1 to 10 (the "0" face of the die will serve as number "10"). At the end of the experiment when receiving your final earnings, you will throw the dice.

- Once to select one of the ten decisions to be used,
- A second time to determine what your earning is for the option you chose, "Option A" or "Option B", for the particular decision selected.

Even though you will make ten decisions, only one of these will really affect your final earnings. Nevertheless, you will not know in advance which decision will be selected. Of course, each decision has an equal chance of being used.

- Look at decision 1.
  Option A pays 8€if the throw of the ten-sided die is 1, and pays 6.4€if the throw is between 2 and 10.
  Option B pays 15.4€if the throw of the ten-sided die is 1, and pays 0.4€if the throw is between 2 and 10.

- Look at decision 2.
  Option A pays 8€if the throw of the ten-sided die is 1 or 2, and pays 6.4€if the throw is between 3 and 10.
  Option B pays 15.4€if the throw of the ten-sided die is 1 or 2, and pays 0.4€if the throw is between 3 and 10.

- The other decisions are similar, except that as you move down the table, the chances of the higher payoff for each option increase. In fact, for decision 10 in the bottom row, the die will not be needed since each option pays the highest payoff for sure. Therefore, in this decision row you make a choice between 8€and 15.4€.

To summarize,

- You will make ten choices now. For each decision row you are asked to make a choice between Option A and Option B. You may choose Option A for some decisions and 0ption B for other rows. You may change your decisions and make them in any order.

- At the end of the session, you will roll the ten-sided die to select which of the ten decisions will be used.
- Then, you will roll the die again to determine your money earnings for the option you chose for the selected decision. Earning for this choice will be added to your other earnings, and will be paid to you in cash at the end of the experiment.

Should you have any questions, please raise your hand and we will come to you and answer your questions in private. Please do not communicate with the other participants.

Please make your choices now and record for each of the ten decision rows whether you prefer Option A or Option B.

	Your choice
Decision 1 Option A: 1 chance out of 10 to earn 8€and 9 chances out of 10 to earn 6.4€ Option B: 1 chance out of 10 to earn 15.4€and 9 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 2 Option A: 2 chances out of 10 to earn 8€and 8 chances out of 10 to earn 6.4€ Option B: 2 chances out of 10 to earn 15.4€and 8 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 3 Option A: 3 chances out of 10 to earn 8€and 7 chances out of 10 to earn 6.4€ Option B: 3 chances out of 10 to earn 15.4€and 7 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 4 Option A: 4 chances out of 10 to earn 8€and 6 chances out of 10 to earn 6.4€ Option B: 4 chances out of 10 to earn 15.4€and 6 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 5 Option A: 5 chances out of 10 to earn 8€and 5 chances out of 10 to earn 6.4€ Option B: 5 chances out of 10 to earn 15.4€and 5 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 6 Option A: 6 chances out of 10 to earn 8€and 4 chances out of 10 to earn 6.4€ Option B: 6 chances out of 10 to earn 15.4€and 4 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 7 Option A: 7 chances out of 10 to earn 8€and 3 chances our of 10 to earn 6.4€ Option B: 7 chances out of 10 to earn 15.4€and 3 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 8 Option A: 8 chances out of 10 to earn 8€and 2 chances out of 10 to earn 6.4€ Option B: 8 chances out of 10 to earn 15.4€and 2 chances out of 10 to earn 0.4€	Option A O Option B O
Decision 9 Option A: 9 chances out of 10 to earn 8€and 1 chances out of 10 to earn 6.4€ Option B: 9 chances out of 10 to earn 15.4€and 1 chance out of 10 to earn 0.4€	Option A O Option B O
Decision 10 Option A: 10 chances out of 10 to earn 8€and 0 chances out of 10 to earn 6.4€ Option B: 10 chances out of 10 to earn 15.4€and 0 chances out of 10 to earn 0.4€	Option A O Option B O

Table 6: Relative Market Activity Performance: Probit regression

Dependent Variable: Reference Shift	HL	RL	RT	CE	SQ
Male	-0.116	-0.176	0.318	0.116	0.153
	(0.213)	(0.277)	(0.249)	(0.116)	(0.177)
Openness (T-score)	0.017**	-0.001	-0.002	-0.016*	0.009
	(0.008)	(0.011)	(0.009)	(0.010)	(0.010)
Consciousness (T-score)	0.011	-0.015	0.007	-0.006	0.001
	(0.012)	(0.011)	(0.009)	(0.007)	(0.011)
Extraversion (T-score)	-0.012	0.027**	0.005	-0.002	0.005
	(0.011)	(0.013)	(0.008)	(0.009)	(0.012)
Agreeableness (T-score)	-0.012	-0.013	-0.004	-0.005	0.002
	(0.012)	(0.011)	(0.009)	(0.012)	(0.008)
Neuroticism (T-score)	-0.007	0.004	-0.023**	-0.003	-0.003
	(0.011)	(0.012)	(0.011)	(0.008)	(0.010)
Age	0.005	-0.232**	0.148*	-0.016	-1.057
	(0.111)	(0.110)	(0.086)	(0.093)	(1.118)
Age^2	-0.001	0.003**	-0.002**	0.000	0.024
	(0.001)	(0.001)	(0.001)	(0.001)	(0.025)
Relative Trading Activity	-0.833	-0.785	-0.602	0.288	-0.422
	(0.863)	(0.805)	(0.657)	(0.627)	(0.726)
Constant	1.308	4.870**	-1.558	1.782	11.540
	(2.055)	(2.053)	(1.885)	(1.816)	(12.413)
N	183	183	183	182	183
Wald chi^2	16.68	21.60	14.26	4.16	5.87
$Prob>chi^2$	0.054	0.010	0.113	0.652	0.955
Pseudo R^2	0.053	0.067	0.047	0.017	0.026
log pseudo-likelihood	-98.720	-74.665	-117.293	-122.459	-122.112
Clusters	21	21	21	21	21

Note: Standard errors in parentheses. $***$ indicates significance at the 0.001 level, $**$ at the 0.05 level, $*$ at the 0.10 level.

Table 7: Bubble Occurrence: Probit regression

Dependent Variable: Reference Shift	HL	RL	RT	CE	SQ
Male	-0.172	-0.204	0.302	0.088	0.133
	(0.225)	(0.289)	(0.249)	(0.124)	(0.167)
Openness (T-score)	0.016**	-0.001	-0.002	-0.015*	0.009
	(0.008)	(0.011)	(0.009)	(0.009)	(0.010)
Consciousness (T-score)	0.009	-0.016	0.006	-0.005	0.001
	(0.011)	(0.011)	(0.009)	(0.007)	(0.012)
Extraversion (T-score)	-0.014	0.025**	0.003	-0.002	0.004
	(0.011)	(0.013)	(0.009)	(0.009)	(0.012)
Agreeableness (T-score)	-0.013	-0.013	-0.004	-0.005	0.002
	(0.012)	(0.012)	(0.010)	(0.012)	(0.008)
Neuroticism (T-score)	-0.006	0.003	-0.023**	-0.002	-0.003
	(0.011)	(0.011)	(0.010)	(0.008)	(0.010)
Age	-0.001	-0.247**	0.145*	-0.009	-0.930
	(0.116)	(0.116)	(0.082)	(0.093)	(1.185)
Age^2	-0.001	0.003**	-0.002**	0.000	0.021
	(0.001)	(0.001)	(0.001)	(0.001)	(0.027)
Dummy Bubble Occurrence	-0.205	0.043	-0.035	-0.205	-0.059
	(0.173)	(0.303)	(0.203)	(0.194)	(0.199)
Constant	1.502	5.116**	-1.483	1.735	10.194
	(2.027)	(2.141)	(1.830)	(1.807)	(12.998)
N	183	183	183	182	183
Wald chi^2	114.87	22.72	14.33	8.03	2.91
Prob>chi^2	0.094	0.007	0.111	0.531	0.968
Pseudo R^2	0.052	0.062	0.045	0.020	0.025
log pseudo-likelihood	-98.863	-75.047	-117.571	-122.098	-122.217
Clusters	21	21	21	21	21

Note: Standard errors in parentheses. $***$ indicates significance at the 0.001 level, $**$ at the 0.05 level, $*$ at the 0.10 level.