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The Effect of Background Mood and Pre-Existing Risk on Risk and Time Preferences

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Thesis

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Abstract

Analysis of risk and time preferences is an important topic, risk aversion and time discounting affect important decisions, such as retirement savings, investment into human capital, choice of preventive healthcare, consumption and others. Risk and time preferences may not be only inherent but also dependent on ambient and some psychological characteristics. This thesis is analysing the effect of background mood, background risks and their interaction on risky and intertemporal choice. The preferences are analysed in the experiment which was conducted with the students of Tilburg University. The results show that mood and pre-existing risks does not have a significant effect on risk preferences but it does affect time preferences. The framing effect influences intertemporal choice between today and the future. For both, choice between today and the future, and between two future periods, joint effect of positive mood and broad framing appears to be significant.

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1. INTRODUCTION

Individuals have to make many decisions during their lifetime that involve risk or intertemporal choice. Even at first sight simple decisions may depend on individual risk and time preferences, for instance people buy a lottery ticket which has a big chance to win nothing and to lose the money paid for a ticket, an individual may choose whether to eat all chocolate at once or leave part of it for the other day. However, sometime people have to take very important and serious decisions that depend on their attitude towards the risk and the level of patience. For example, a surgeon has very often to make quick and risky decisions, an investor chooses a risky or a safe fund, a driver may choose to drive safely according to the rules or abuse the rules, people decide when to start saving money for their retirement, how quick to spend their salary, whether to invest in their human capital by studying or start working. These examples show that analysis of risk and time preferences is an important topic and it can explain why people make certain decisions.

Most of economic models and theories assume that agents are rational: have rational expectations, make rational choices and act strategically. However, in real life situations we see that people very often deviate from rationality. Many psychological aspects may shape the behavior, expectations and choices of individuals. Until the middle of 20^{th} century there was almost no psychology involved in economics theory. Just at the end of the century behavioral economics and topics on bounded rationality, cognitive psychology, brain as an information-processing device became popular among the economists (Camerer and Loewenstein, 2003). The convergence of economics and psychology in the area of decision making under risk and uncertainty has been greater than in any other topic that is of mutual interest to both disciplines.

Thus, it is interesting to analyze whether some psychological aspects may influence risk and time preferences. Both psychologists and economists usually study choice under risk with a consequentialist perspective, which means that people make decisions by evaluating the consequences of possible choice alternatives. Many researchers assume that risky choice is a cognitive activity and see feelings evoked by the decision situation separate from the decision making process. However, we cannot neglect the fact that background emotions and information brought to the mind just before decision making do influence our way of thinking, the decisions we make and our behavior. Both emotions and cognitive thinking is

used when evaluating risks and intertemporal choice. Cognitive evaluation is influenced by probabilities, delay and outcomes, whereas emotions do react to cognitive evaluation but may also arise with minimal cognitive processing. LeDoux (1996) wrote: “emotions can flood consciousness...because the wiring of the brain at this point in our evolutionary history is such that connections from the emotional system to the cognitive system are stronger than connections from the cognitive systems to the emotional systems”. The decision-theoretical approach ignores the role of emotions in decision making under risk. Most of the research done, analyzed emotions after the decision making, i.e. emotions that are raised by the outcome, however not a lot of attention was given to the emotions experienced during decision making or just before making a decision. It is possible that the same individual may act differently in the same situation when he/she is in a good mood compared to when he/she is in a bad mood.

Despite the mood, thoughts brought to the individual’s mind just before the decision making may also influence the choice. Reminding people about their financial situation and income uncertainty they may face in the near future might induce them to think about the current situation broader and account for pre-existing risks, whereas, individuals who do not have explicit accessibility to this information might not account for background risks and look at the current choice with narrow perspective. In my thesis I want to check whether people tend to frame the situation narrow, that is evaluate the prospect in isolation, and if reminding them about the uncertainties they are facing would induce them to thing broader and incorporate the pre-existing risks in a decision making. Guiso (2009) found that individuals who are induced to account for the risk they already face are less likely to reject a lottery than individuals who focus just on the lottery and in this way ignore the risk-insurance property of the prospect. This phenomenon is called of narrow framing and it may explain some financial behavior, for example equity premium puzzle (Barberis and Huang, 2006).

It is possible that mood may influence whether and how strong people react to framing effect. Some studies have found (Rowe, et al, 2007, and Avramova, et al, 2010) that individuals who are in a positive mood have increased breath of attentional selection and broader perceptual field. Therefore, I want to check if there exist a joint effect of mood and framing on decision making, whether a particular mood might make individual be more or less sensitive to framing effect or maybe the effect goes other way round and questions about the background risks strengthen or reduce a particular mood and its effect on decision making.

The aim of this thesis is to analyze the impact of mild positive or negative affect, background risks and their interaction on individual decision making, particularly on risky and intertemporal choice.

My hypothesis is that risk and time preferences should be different among individuals in a positive and in a negative mood, moreover reminding them about the financial risks they are already facing should influence their risky and intertemporal choice. I also presume that there may be a joint effect of mood and framing on preferences.

Distinct from previous literature I do analyze the effect of mood and framing on intertemporal choice, whereas most of the research done before concentrates on mood or framing effect exclusively on risky choice. Time preferences are not researched that extensively, especially literature about faming effect on time preferences is still scarce. However, time preferences analysis is an important topic as it leads to self-control problems, which may cause negative outcomes as obesity, overconsumption, addiction, reduced retirement savings and human capital accumulation. It is possible that intertemporal decisions with an inclusion and in isolation from risks can lead to completely different choice. An individual who thinks about the uncertainty of future income may become more patient or impatient in certain situations. For example, if a person is in a very risky financial situation, then he/she may prefer a smaller but sooner payment just to have a backup finance in case a bad outcome occurs, whereas if he/she knows that a big uncertainty is waiting in a far future, delayed revenue might be preferred in order to have money to insure oneself in the future. Moreover, I analyse the joint effect of mood and framing effect on risk and time preferences. All the existing literature analysed the effect of those two factors separately and did not investigate the interaction of the two.

The method of analysis is an experiment with real monetary payoffs. Payments are partly dependent on the choice made in the experiment, thus, preferences are related to actual choices. The experiment was conducted with students of Tilburg University. First, subjects were randomly assigned to watch a short sad or funny video which was shown with a purpose to affect the mood. Afterwards, subjects were assigned to two treatment groups – broad and narrow framing. Participants in a broad framing treatment before risk and time preference determination had to answer some questions about the expected income and their distribution over the next year and about the accumulated savings. The ones in a narrow framing treatment were asked those questions at the end of the experiment. This strategy is used in order to

induce individuals to remember the risks they are already facing and think about the choice they have to make with a broader standpoint. Risk and time preferences were measured using a multiple price list (MPL) method, where subjects are presented with a choice between a lottery and a sure amount for risk preference determination and two payoffs with a different delay for time preference determination.

The rest of the thesis is organized as follows. Section 2 reviews the literature on mood and framing effect on risk and time preferences. The method of research and design of the experiment is discussed in section 3, section 4 provides hypotheses. Data is described and the main results are provided in section 5, section 6 concludes and gives suggestions for further research.

2. LITERATURE REVIEW

In this chapter I overview previous research that analyzed the effect of mood on risk and time preferences as well the literature about the effect of background risks on risky and intertemporal choice.

2.1 Background mood effect on risk preferences

Feelings at the moment of decision making influence judgements and choices people make. Risk judgements may be affected directly by mood content and indirectly from mood impact on cognition process. The affect-as-information hypothesis (Schwarz and Clore, 1983) states that feelings affect people's judgements and choices. People make judgements based in part on how they feel. Loewenstein et al. (2001) proposed the risk-as-feelings hypothesis (appendix A provides the risk-as-feelings hypothesis graphically), which states that there is a role of affect experienced at the moment of decision making[1].

The risk-as-feelings hypothesis states that our responses to risky situations result from direct emotional influences, cognitive evaluation and their interaction. Cognitive evaluation of probabilities and outcomes influence our feelings and feelings also exert influence on cognitive evaluation. Moreover, background mood affects feelings which influence behavior directly or through the cognitive evaluation.

Neuroscientists also provide evidence that mood affects the choice. Ashby et al. (1999) proposed the dopaminergic theory, which states that during periods of mild positive affect there is a concomitant increased dopamine release in the mesocorticolimbic system and perhaps also in the nigrostriatal system. Authors claim that increased dopamine levels influence performance on a variety of cognitive tasks. Dopamine is used as a reward system in the brain. The level of dopamine is related to risk-seeking behavior, impatience, addiction and self-control problems. Researchers at Vanderbilt University in Nashville and Albert Einstein College of Medicine in New York City says that there is a biological explanation why certain people tent to take risk and are novelty-seekers, this explanation involves neurotransmitter dopamine, the brain's chemical that makes feel good (A. Park, 2008).

[1] However, the risk-as-feelings hypothesis is not that relevant for the current research as it concentrates on anticipated (emotions expected to be experienced in the future when outcomes occur) and anticipatory (immediate reactions to risk and uncertainty) emotions

Research has shown that people's current moods tend to affect their judgments and perceptions. Mood may also affect willingness to take risk. In psychology there are two opposing views about mood states and risk-taking: the Affected Infusion Model and the Mood Maintenance Hypothesis. The Affected Infusion Model (AIM) suggests that positive mood increases risk-taking behavior while negative mood reduces the tendency to take risks (Forgas 1995). When making judgements in elated mood individuals rely on positive cues and are more likely to have thoughts about the positive aspects of a risky situation than people in a bad mood. Individuals in a positive mood perceive the outcome of risky choice as more favourable and this could lead to increased willingness to take risk. On the other hand, individuals in a negative mood are more likely to perceive the environment as threatening and they are more likely to think carefully and systematically in order to avoid potential losses which lead to more conservative decisions in risky situations.

The other view on mood and risk preferences is the Mood Maintenance Hypothesis (MMH), which asserts that people in elated moods may not want to risk losing the elated state and thus render themselves more risk averse (Isen and Patrick, 1983). The Mood Maintenance Hypothesis states that people in elated moods want to maintain their positive affective states and because of that they are not willing to take risk as it increases a potential for substantial losses and that would reduce their positive mood. On the other hand, people that are in a negative mood take a risk because there is a potential of gain and hope to uplift a negative mood. The effect of mood on risky behavior is explained through an innate desire to maintain positive mood or to reduce negative mood. Unlike AIM, MMH is based on consequentialist reasoning, i.e. emotions that are expected to occur when the outcomes are announcer.

Most research done on the background mood effect on risk preferences induce participants with a particular mood before asking to make a decision in a risky choice situation. Usually used techniques for mood induction are: self-statement procedure (Velten mood induction[2]), playing music, showing a video, using hypnosis, asking subjects to complete a test and after that telling them that they did badly or well, asking participants to remember sad or happy events from their life or asking them to imagine hypothetical situations. Below I review studies that investigated mood influence on risky choice decisions.

[2] It is a simple approach that involves reading, reflecting on and trying to feel the effects of some 58 positive (negative) affirmations as they wash over you. The statements start out being fairly neutral and become progressively more positive (negative).

Some researchers have found results that are in line with the AIM. Yuen and Lee (2003) by showing participants happy, neutral or sad movie clip induced a particular mood and then determined risk preferences of individuals using the Choice Dilemmas Questionnaire (developed by Kogan and Wallach 1964) which includes realistic and detailed descriptions of common everyday life dilemmas. They found that individuals in induced depressed mood were significantly more conservative in risk taking than individuals in a neutral mood, while there was no significant difference between neutral and elated mood participants' behavior. The explanation for the result is that the presence of negative mood signified a dangerous environment and individuals became more cautious. They found an asymmetric effect between positive and negative mood, which shows that there might be different mechanisms in which positive and negative moods influence risk taking judgments. However, those findings were in contrast to some previous research which suggested that the influence of positive mood would be more significant than the influence of negative mood.

Chou, Lee and Ho (2007) investigated the influence of age differences on specific moods for risk taking behavior. The mood was induced by showing a movie clip and risk preferences were measured by the decisions made in tasks modified from the Choice Dilemmas Questionnaire. Their findings were consistent with the Affected Infusion Model, both younger and older participants that were in a happy mood had a greater tendency for risk taking than the ones in a sad mood. The authors also found an asymmetric effect between positive and negative moods in both young and older participants, but with opposite directions. For older adults the impact of positive mood on risk taking was bigger than the effect of negative mood, whereas for young adults the effect of negative mood was stronger than the effect of positive mood.

Research mentioned above found evidence for Affected Infusion Model (AIM), however there is also research that found evidence supporting the Mood Maintenance Hypothesis (MMH).

Kliger and Levy (2002) studied mood effect on real-life decision data. The authors analysed the relationship between mood and risk attitudes in the capital market, where risk preferences were recovered from capital market data (call option prices). They assumed that people's mood correlates with weather conditions, thus the mood of participants was assessed indirectly by the weather conditions. Results showed a negative correlation between mood

and risk aversion, i.e. good mood is associated with investors being less willing to tolerate risk.

Mano (1992) provided further support for the Mood Maintenance Hypothesis in a study investigating the effects of mood on risk-taking judgements among undergraduates and MBA students. After mood induction students were asked how much money they would be willing to pay for lottery tickets and also to select a lottery from the variety of tickets with different probabilities of success. The author found that students in a bad mood condition (distress) were willing to pay more for lottery tickets (which means higher risk taking) compared to those that were not distressed. Distressed individuals also showed a tendency to choose more lottery tickets with lower probability of winning a large prize.

There are both studies which support The AIM and the MMH. Kim and Kanfer (2009) analyzed the effect of negative mood on risk preferences. And found that in some cases the results are in line with the AIM and sometimes with the MMH. Their study assigned participants into three groups: immediate judgment group where participants did risk judgements just after mood induction, delayed judgment condition where risk judgements were made after mood induction but with delay and the third group made risk judgments following the performance of a cognitively demanding task (word anagram task) after the mood induction condition. Negative mood was induced by showing scenes from the movie "*Sophie's choice*", risk preferences were determined by making choices in dilemmas. Authors found that if a cognitive demanding task intervenes between negative mood induction and risk taking judgments subjects exhibited lower levels of risk-taking (offering a support for the AIM) as opposed to higher levels of risk-taking when there is no intervening cognitive task (offering a support for the MMH).

On the other hand, Drichoutis and Nayga (2010) tested whether induced mood states have an effect on elicited risk preferences and did not find a significant effect. Mood was induced by asking participants to complete a hard or easy MENSA test, risk preferences were elicited using multiple price list where subjects had to choose between two lotteries. The results showed that risk preferences between subjects in the control, positive mood, and negative mood treatments are neither economically nor statistically significant.

Furthermore, some studies found that different negative moods contribute differently to risky behavior. Anger, fear, sadness, depression, anxiety can have different effect on risk taking tendencies. For example, depressed mood is found to decrease the tendency to take risk (Yuen

and Lee, 2003; Pietromonaco and Rook, 1987), whereas anxiety and anger increases this tendency (Leith and Baumeister, 1996). It was also found that young adults are more affected by negative information than by positive information and this affects decision making, memory and impression formation (Baumeister et al. 2001), which is in line with Chou et al. (2007) study.

2.2 Background mood effect on time preferences

Many studies in the literature that analyzed the relationship between mood and risk preferences, however not a lot of studies investigated mood effects on time preferences. There is neurological evidence that brain function (particularly, in the prefrontal cortex) and neurotransmitters associated with emotions (notably serotonin) are linked to intertemporal decision making (Dayan and Huys, 2009). Ashby et al. (1999) in their dopaminergic theory stated that mild positive affect increased dopamine which is used as a reward system in the brain and is related to risk-seeking behavior, impatience, addiction and self-control problems. Enhancing dopamine activity increases impulsivity and leads to excessive discounting of delayed outcomes (A. Pine et al., 2010).

McLeish and Oxoby (2007) found that individuals' single period discount rates are stable over time, but that there is some evidence of dynamic inconsistency. Their results showed no differences in the discount rates of men and women, but gender differences appeared in the character of hyperbolic discounting, where women displayed greater patience in their present bias. When the authors analyzed gender-mood interaction they found that negative mood in women increase their impulsiveness, whereas positive affect in women and both positive and negative effect in men yields little change. The mood was induced by telling the outcome of previously played bargaining game. Time preferences were indicated by asking to choose between a smaller sum of money in a sooner period and a larger sum after a longer period.

Ifcher and Zarghamee (2010) induced positive and neutral mood using short video clips and after that participants had to answer 30 time preference questions. Authors found that mild positive affect significantly reduces time preference, that is, increases the present value of a future payment (makes participants more patient).

From the theory of psychology there are a few possible explanations why positive affect may increase the present value of a future payment. First, Isen (2008) found that mild positive

mood broadens focus and attention, makes people more open to information and improves integration of information. Thus, reduced time discounting may come from more thorough consideration. This is also supported by the "dopamine hypothesis", which states that release of dopamine (which is a neurotransmitter linked to rewards) in the areas of the brain responsible for cognitive flexibility is as a mediator in the effect of positive affect on behavior. The second explanation comes from the fact that positive affect replenishes will power (Isen, 2007). Thus, according to this mild positive affect should increase forward-looking thinking and self control. Third, different positive or negative affects can have different effect. For example, two negative affects as anger or sadness may influence decision making in a different way, that is, the same individual when he/she is in a sad mood and when he/she is angry might have very different choice in the same intertemoral choice task. Different positive affects does not have such different effect on preferences, for example happy or amused individual might have the same time discounting. Negative affects are more likely to have variant effects and positive affects are less likely to have variant effects. Thus, the result that positive affect increases self control may be applied to wide range of positive affects, such as amusement, happiness, excitement and others.

On the other hand there are studies that found the opposite result. Drichoutis and Nayga (2010) compared time preferences among three groups of individuals, participants in the first group were induced with positive mood, the second group was induced with negative mood and in the control group the mood was just measured but not induced. Mood was induced by using easy and hard MENSA test; time preferences were determined by asking to choose between sooner and later payments. Authors found that subjects who are in positive mood exhibit higher discount rates and subjects under the negative mood do not differ from control group significantly. This result was in contrast to Ifcher and Zarghamee (2010) findings which may be because they did not account for risk preferences and implicitly assumed risk neutrality in eliciting time preferences. Some other possible explanations for the result is that positive mood increases the level of happiness and it makes individuals to think less about the future.

2.3 Background risk effect on risk preferences

The target of thesis is not only to address the effect of mood but also the effect of framing on risk and time preferences. Narrow framing is related to the "Dual process theory" according which processes consist of an implicit (automatic, unconscious) and an explicit (controlled,

conscious) part (Kahneman, 2003 and Sloman, 1996). Explicit processes may change with persuasion and education, whereas an implicit process takes longer time to change with the formation of new habits. When making a decision people may rely on reasoning or intuition. Reasoning is a deliberate action, whereas intuitive thinking is spontaneous and depends on the first thoughts that come to mind. Intuitive decisions are associative and affected by the context. The elements that come or are brought first to the mind of a decision maker may influence the choice. Thus, it is important what information is available at the moment of decision. Information, questions and other elements brought to people's mind just before the choice are the most visible and accessible at that particular moment and, therefore, it is very likely that they may have a big weight during the decision making. The questions about the expected future income and their distribution should stimulate the thoughts about the background risks and this in turn may affect risk preferences and time discounting.

There is a wide range of research done considering the effect of different framing on risky choice. Most of them analyzed the effect of reframing the situation, such as negative versus positive framework (Donovan and Jalleh, 1999), segregated versus aggregated framing (Langer and Weber, 2001; Benartzi and Thaler, 1993), and a different length of the evaluation period (Gneezy and Potters, 1997).

However, not many researchers analyzed the situation when a framework itself of situation is not changed but people are induced to think about some aspects of their life before making decision. One paper addressing this problem, which is the most similar to this with respect to framing and risk preferences, is done by Guiso (2009). The author used a test of narrow framing to explain the phenomena that people reject small positive expected value lotteries. Participants were randomly assigned to two groups, where one group had to report their subjective probability of future earnings before and the other group after the lottery question. Guiso found that individuals who were induced to think about their earnings risk before facing a risky choice were less likely to turn the lottery down. The effect was strongest among those who actually faced income risk and could have benefit from the proposed lottery. This result is in line with a hypothesis that people focus on the most visible facts and if not reminded they tend to ignore the interaction between a proposed lottery and other wealth components and background risks. However, current research differs from Guiso as we offer real payments in the experiment and Guiso was offering a hypothetical lottery, he also concentrated on the origins of narrow framing, particularly the role of regret and thinking mode.

2.4 Background risk effect on time preferences

Framing effect on time preferences have not been researched as extensively as its effect on risk preferences. Previous research showed that it is important what information is available at the moment of decision making, that reminding an individual about other risks that he/she is facing or may face in the future can influence the decision in a risky choice task. It may be that background risks affect not only risk aversion but also time discounting.

Heijden et al. (2010) hypothesize that individuals who care less about the future will tent to frame more narrowly and found that tendency to frame narrowly is not related to discount rates. However, the results showed that it is easier to induce inpatient individuals to frame more broadly. The authors checked whether time preferences affect the tendency to frame narrowly, in my research I want to check the reverse hypothesis, which is whether reminding about the background risks (inducing individuals to frame the situations broadly) affects time preferences.

2.5 Interaction between background mood and background risks

Both background mood and background risks may affect risk and time preferences. Moreover, it is possible that risk preferences and time discounting are affected by the interaction of mood and background risks. Mood may have an effect not only directly on time and risk preferences but also through the framing effect. It can be that people in a sad or elated mood are more observant, are more influenced by the questions about their income distribution and are easier to induce to frame the situation broad.

Rowe et al. (2007) found that during positive mood individuals have increased breadth of attentional selection. In their experiment positive and negative moods were induced by music and neutral mood was induced by reading a collection of basic facts about Canada. The effect of mood was measured in two different cognitive domains: semantic search and visual selective attention. Findings of the experiment demonstrated that positive mood results in a change, particularly increase, in the breath of attentional allocation to external visual and internal conceptual space.

Avramova et al. (2010) performed five experiments in order to investigate whether mood affects context-dependence. Participants of an experiment were asked to judge the

temperature of water, weight of a target and size (by performing Ebbinghaus illusion task and drawing a line in the line–frame proportion). The experiment was extended to a social domain where participants rated a happy or sad target from facial expression. The results showed that negative mood promotes the attention to a target, whereas positive mood stimulates broader attention to both the target and the context. Judgement of the situation is stronger affected by the information in the context when an individual is in a positive than in a negative mood. The hypothesis, that positive mood broadens the perceptual field and facilitates incorporation of contextual information in target judgment, whereas negative mood narrows the perceptual field and elicits a stronger focus on the target was confirmed. Happy people were more influenced by the context than sad people. Thus, happy people have a broader visual scope, more open and generative mindset, focus on more global features of stimuli, whereas people in a sad mood have narrower visual scope, a more detail-oriented and analytical mind, focus on local features of stimuli.

On the other hand, Bless et al. (1990) did an empirical study with students analyzing mood influence on students' attitude towards an increase in student service fee. Mood was induced by asking to write a report about sad or happy life event; afterwards students listened to a speaker who presented weak or strong arguments in favor of an increase in student service fee. Later participants were asked to recall the information. As a result students in a negative mood remembered the message in more details compared to individuals in a positive or neutral mood state. Individuals in a negative or neutral mood state were also more affected by the quality of arguments as they were more likely to engage in a systematic processing of the content of the message. Negative mood makes people to engage in a more effortful information analysis, whereas individuals in a positive mood use more intuitive and heuristic decision making strategies. This is in line with the results of Forgas (1995), who found that when making judgments, individuals in a positive mood state are more likely to apply heuristics-processing (simplified, intuitive judgments) and less accurate strategies, whereas individuals in a negative mood state are more likely to apply systematic-processing and more accurate strategies.

In the following section I describe the design of experiment, the mood induction procedure and how I evaluate the effect of background mood and risks on risk and time preferences.

3. EXPERIMENT DESIGN

The idea of the experiment is to expose randomly individuals before they perform tasks of risk and time preference determination to different moods and different degree of accessibility to their pre-existing income risks.

The experiment is conducted in Tilburg University; all the participants of the experiment are students of the university (example of the experiment can be found in appendix B). Personal emails are sent to students that are registered in a database of CentER lab informing about the experiment and inviting to register. Students who got an email and other students of Tilburg University can register for the experiment on the CentER lab website. The experiment lasts two days, each day there are six sessions organized.

The aim of experiment is to see how background mood and risks affect individual time and risk preferences. The experiment consists of two parts. First part of the experiment is used to induce participants with a certain mood, whereas the second part of experiment is used to determine individual risk and time preferences.

The experiment begins with a mood induction phase. This part of the experiment lasts approximately 10 minutes depending on how much time participants take to answer the questions. Half of participants is induced with a sad mood and the other half of participants is induced with an elated mood. In the literature we can find many different ways to induce a mood: show a video, ask to read a story, ask to remember an event from the participant's life, show a picture, ask to listen to a music, ask to make a test and then announce good or bad results and others. The success of mood induction may differ depending on the technique used. Martin (1990) analyzed different methods of mood induction and found that films successfully induce the required mood in more than 75% of cases, whereas some techniques as facial expression, self-statement, social feedback and others achieved approximately 50% success. Westermann et al. (1996) using a meta-analytical procedures evaluated the effectiveness and validity of 11 mood induction procedures; they integrated two hundred and fifty effects of mood induction in adult nonclinical samples. The results showed that the effect was generally larger for negative than for positive mood induction, however film/story mood induction attained equally high scores for both inductions. For both positive and negative mood induction the most effective was a presentation of a film or story.

Consequently, I choose to show a short 5-6 minutes length video to induce participants with a sad or elated mood. Digital media is interactive, uses sounds, colors and imagery, thus it is more effective than showing a picture or asking to read a story. Participants are randomly assigned to one of the treatment groups – positive affect, which suppose to induce happy or elated mood, or negative affect, which supposed to induce sad mood, treatment. Happy and sad videos are alternated every other session. Students in one session are showed the same video in order that sounds or laugh when watching a funny video would not distract individuals watching a sad video. Participants in the "negative mood" treatment are shown a scene from a movie "*Sophie's choice*"[3]. The video depicts a scene where the main character Sophie is forced to choose which one of her two children to send to the gas chamber. This scene was already used in the experiment by Erber and Tesser (1992) and appeared to be effective in inducing negative mood. Subjects in a "positive mood" treatment watch the scene from well known series "*Friends*"[4]. The video shows how one of the characters is moving out and wants to give her painting to one of friends. The friends do not like the painting but pretend to fight for it in order not to offend a girl owning the painting. A short scene from *"Friends"* was also used and successfully induced positive mood in Krahmer et al. (2004) experiment.

Participants are not told that video is shown to induce mood, instead they are told that the experiment consists of two separate parts where during the first part they are asked to watch a short video and afterwards answer few questions related to that video. They are told that this part of the experiment checks their perceptiveness and acuteness. This is done with a purpose for participants not to understand that video is showed to influence their mood and preferences in the following tasks and that we would escape from demand effect, when participants try to act as they think they are expected to act.

At the beginning of the second part of the experiment I ask individuals to give some demographic data, such as gender, age, nationality, studying program and field. The questionnaire about demographic background information ends with questions about the current mood of participants. This is done in order to check whether mood induction was successful. Two types of self-report measures are used to determine the mood. First, participants are asked to rate their current mood state along a 10 point scale, ranging from very bad (1) to very good (10). In addition to that, a short version of Positive and Negative

[3] http://www.youtube.com/watch?v=DZ9bht5H2p4
[4] http://www.youtube.com/watch?v=p1nfnMUmqiA&feature=related

Affect Schedules (PANAS; Watson et al. 1988) is used where students have to evaluate their current feelings in terms of 20 PANAS - 10 positive (such as proud, excited, energetic) and 10 negative (such as irritable, distressed, guilty) affect on a scale from 1 (not at all) to 5 (extremely). Previous research showed the validity of PANAS for measuring positive and negative mood (Watson et al. 1988). A short version of PANAS was also used by Drichoutis and Nayga (2010), Kim and Kanfer (2009) and others.

What is more, for studying a mood impact for preferences it is important how long the induced mood lasts and whether mood is still affected when individuals do risky and intertemporal choice tasks. Frost and Green (1982) analyzed the duration of effects of the Velten mood induction procedure (VMIP) and found that VMIP effects endured for 10 minutes. Participants showed a significant improvement in depressed mood when compared post-induction and post-wait periods. The negative effect was still present after 10 minutes but considerably weaker. However subjects who were induced with elated mood, 10 minutes after induction were not any more elated when compared to the ones in a neutral condition. On the other hand, Isen et al. (1976) found that the effect of mood induction declined gradually over time and by 20 minutes after the induction the experimental group did not differ from the control group. In our experiment the participants are expected to do the tasks that follow mood induction in approximately 10 – 15 minutes, therefore I expect that the induced mood still prevail and affect the performance in the risky and intertemporal choice tasks.

The second part of the experiment concentrates on individual risk and time preferences. In order to check if there is a framing effect, just before the risky and intertemporal choice tasks, participants are exposed to different degree of accessibility to the income risks they are already facing. To increase the accessibility to the pre-existing risks I use questions about the expected minimum and maximum income over the next twelve months, the probability that expected income will be higher than expected average ((Xmax + Xmin)/2) and the amount of savings that individual has accumulated. Part of the questions are based on a research done by Guiso (2009), who before a question about willingness to accept a small lottery asked participants to determine the probability distribution of earnings one year ahead (minimum and maximum expected amount over next twelve months and probability that income will be greater than the average expected income). Minimum and maximum expected earnings show whether individuals are facing some income uncertainty, if the range ($X_{max} - X_{min}$) is positive then there is some variability in the future income. By asking what is the probability that

expected income will be higher than $(X_{max} + X_{min})/2$ we get an idea about the distribution of expected income. For example, if individual states that this probability is more than 50 percent, then the income distribution is skewed to the left. The amount of accumulated savings determines the financial wealth of individuals and this variable is important when checking whether being richer or poorer makes you take more risk or be more impatient.

These questions are asked with an intention to make participants to account for the other risks they are already facing and to induce them think broader when making choices in the following tasks. In order to check if these questions encourage individuals to frame the situation broader, subjects are randomly assigned to two groups: those who have an access to pre-existing risk before and after the risky and intertemporal choice tasks.

Therefore, at the end there are 2 x 2 treatments, where participants are randomly assigned either to positive or negative mood treatment and either to narrow or broad framing treatment (for a better understanding of the experimental design look at a graphical representation in an appendix C).

Risk preferences are determined using a very common approach in experimental economics, a multiple price list (MPL) proposed by Holt and Laury (2002) and Eckel and Grossman (2002). The MPL requires individuals to make series of choices between two lotteries or a lottery and a guaranteed payment, where payoffs or/and probabilities change along the list.

MPL is widely used in economics literature (Holt and Layry, (2002); Eckel and Grossman, (2002); Drichoutis and Nayga, (2010); and others). There are few reasons of using this technique to elicit risk preferences. MPL allows matching actual choices with real payoffs. Moreover, the structure of experiment is relatively easy to understand, preferences at the top and at the bottom of the list are usually strong and they become weaker around the middle of the list.

In the current experiment subjects have to make dichotomous choices between a lottery and a certain amount of money. In total, individuals have to make 20 choices. The lottery is the same in all choices; it is a fifty-fifty chance of winning 10 euros or nothing, whereas a certain amount is ranging from 50 cents to 10 euros, where payoff is increasing successively by 50 cents in each row. MPL in this experiment is based on one task in Sutter et al. (2010) experiment, where they ask participants to make 20 choices: choose between a safe amount ranging from 50 cents to 10 euros increasing by 50 cents each next choice or draw a ball from

the bag containing 20 balls with a 50 percent chance to win 10 euros and 50 percent chance to win nothing depending on the color of the ball drawn.

Participants are notified about the payment structure and told that the payoff depends on choices they make and on a chance. In this task one of the 20 choices made is actually paid, which decision is paid is determined by a throw of a fair 20-sided die. The money is paid individually right after the experiment. A certain amount of money is paid if in the winning decision individual chose a sure amount, and a throw of a fair six-sided die determines the payment if in a winning decision a lottery is chosen (an even number of six-sided die means a win of 10 euros and an odd number of ace means winning nothing). Risk preferences are determined by the number of choices when individual picks a sure payment, in other words the number of choices after an individual switches from lottery to a certain payment. The number of certain choices can range from zero to twenty. Risk preferences are estimated directly from the choices individual make without making any parametric assumptions.

To determine time preferences of individuals the MPL is used again, which for time preference determination was proposed by Coller and Williams (1999). In time preference task participants have to make choices between sooner but lower payment, and delayed but higher amount. In the literature there is evidence that individuals are more patient about future delays than about immediate delays of the same length; this inconsistency is captured by the quasi-hyperbolic discounting model (Laibson, 1997). Therefore, there are two task regarding time preference determination. In the first task students are asked to choose between 15 euros today and higher amount after one month. Participants have to make 20 choices, where delayed amount is increasing from 15 euros to 20.60 euros by 30 cents each decision. In the second intertemporal choice task participants are choosing between the same amounts but this time the lower payoff is in one month form the day of experiment and the higher payment is after four months from the experiment. In both tasks a length of delay is one month. A further delay than four months is not chosen as participants of the experiment are students and after the longer time some of them might graduate, start working and, thus, this amount of money may not be relevant to them. The aim of this task is to determine the switching point; that it when an individual prefers to get a delayed payoff instead of getting money today or in a sooner period. Time preferences are determined directly from the choices made. It is measured by the number of early choices, which may range from zero to twenty.

The payment structure is explained to participants. Because of relatively high payoffs (smaller payoffs are not chosen as they may not be high enough to have an impact on time discounting) just one out of twenty participants is actually paid one of the choice made in the first intertemporal decision task and one out of twenty is paid in the second task. First, a fair 20-sided die determines whether individual is selected for a payment (the subject has to role number "1" in order to be selected for a payment), then if selected the throw of a fair 20-sided die determines which one of twenty choices will be actually paid. The payment is paid after the experiment or transferred to the participant's bank account stated that transfer has to be done after one, three or four months respectively.

To sum up, the experiment is designed to determine whether there are differences in individual risk and time preferences in different treatment groups. There are four treatments into which participants are assigned randomly. In the first treatment participants are induced with positive mood and encouraged to think broader (asked questions about their financial situation before doing risk and time preference determination task), the second treatment consists of students that are induced with positive mood but before time and risk preference tasks they are not affected by any questions. The third and the forth treatments are induced with negative mood, where in one of them questions related to financial risks come before and in the other one after risky and intertemporal choice tasks.

4. HYPOTHESES

After reviewing the existing literature on mood and framing effect on risk and time preferences, below I hypothesize what I expect to find in the conducted experiment.

There are two opposing views when considering mood effects on risk preferences: the Affected Infusion Model (AIM) and the Mood Maintenance Hypothesis (MMH). The AIM suggests that positive mood increases risk-taking behavior and negative mood reduces the tendency to take risk, whereas the MMH predicts the opposite result, i.e. that being in a positive mood reduces tendency to take risk and being in a negative mood increases willingness to take risk. After review of the literature, I expect that AIM and not MMH should hold. I expect that sad or depressed mood should decrease the tendency to take risk as it was also found by Yuen and Lee (2003), Chou, Lee and Ho (2007), and Pietromonaco and Rook (1987) and elated mood should increase it.

> **Hypothesis 1***: Mood and risk preference.* Individuals in a positive mood are expected to be more willing to take risk than those in a negative mood treatment.

There is not much research done about how the mood affects time preferences. Different studies propose different results, some of them compare just positive or negative mood with neutral mood. After analysing previous studies and their explanations for the obtained results I would expect to find that there should be a difference among individuals in a positive and in a negative mood treatment. Particularly, I expect to find result in line with the ones of Ifcher and Zarghamee (2010), and McLeish and Oxoby (2007), who got that people in a positive mood demonstrate more patience and self-control than individuals in a negative mood. I would expect to find some dynamic inconsistencies in preferences; it is I assume that there should be differences in the characters of hyperbolic discounting. I expect that mood will affect the choice between today and the future more than the choice between two future periods. Thus, individuals in a negative affect should display greater “present bias”.

> **Hypothesis 2:** *Mood and time preference.* Individuals in a positive mood treatment should exhibit lower discount rate than individuals in a negative mood treatment. The effect should be stronger for the choice between today and a future period than for two delayed periods.

Considering risk preferences and narrow framing, I would expect to find similar result as Guiso (2009) obtained. That is, people who are encouraged to bring to the mind their expected income distribution should realize that they are already facing many risks in their life. The risk in a choice offered to them in the experiment should seem relatively small compared to all the other risks. Thus, I would expect subjects in a broad framing treatment to be less risk averse compared to the ones who are not asked to think about their income and wealth.

> **Hypothesis 3:** *Narrow framing and risk preference.* Individuals induced to think about their income risks will take more risk compared to those who make risky choice in isolation.

There are not many studies analyzing the effect of decision framing on intertemporal choice. Heijden et al. (2010) found that narrow framing is not related to discount rates. I would expect that inducing individuals to think about their income distribution and accumulated wealth should not make any or a very small significant change in their time preferences depending on the situation. I suppose that the effect may exist if an individual is facing big income uncertainty and this could make him/her less patient and willing to insure against future uncertainties. I would expect to find some dynamic inconsistencies in this affect, as it was found by McLeish and Oxoby (2007). Particularly, the framing effect should affect beta (discount factor between today and future in a quasi-hyperbolic discounting model[5], Laibson (1997)) but not delta coefficient (discount factor between two future periods) in time discounting. In the other words, I expect that questions about the pre-existing risk may induce individuals to frame the situation broader and this meanwhile increases their "present bias".

> **Hypothesis 4:** *Narrow framing and time preferences. Q*uestions about accumulated wealth and income risks do not influence at all or make individuals less patient depending on their financial situation. In case the effect occurs, it is expected to affect preferences between today and future but not between two future periods.

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[5] Discount function in a quasi-hyperbolic discounting model is: $D(k) = \begin{cases} 1 & \text{if } k = 0 \\ \beta\delta^k & \text{if } k > 0 \end{cases}$

Where k is a delay in the reward and β captures extra bias for current period over the future.

Previous studies (Rowe et al. 2007, and Avramova et al. 2010) have found that people in a positive mood have a broader perceptual field and focus more on global features compared to the individuals who are in a sad mood. Thus, I expect that individuals in a positive mood will react to framing effect stronger compared to the individuals in a negative mood.

> **Hypothesis 5:** *Framing and mood.* People in a positive affect treatment will be more sensitive to framing effect than those in a negative affect treatment.

For risk preferences I would expect that being in both positive mood and broad framing treatments would lead to more risky choices as I already assumed that separately positive mood and reminding about the risks individual is already facing leads to more risky behavior.

For time preferences I assumed that positive mood makes individuals more patient whereas reminding about the background risks may have no affect or make individuals less patient, therefore joint effect of positive mood and broad framing might be ambiguous.

In the following section I provide the results of experiment.

5. RESULTS

In the following chapter I provide the results of the experiment. Section 5.1 gives the analysis of data and section 5.2 provides regressions that show what factors influence the decisions in the risky and intertemporal choice.

5.1 Descriptive statistics

The MPL used for risk and time preference determination has a simple design; however it may yield inconsistent choices when subjects switch repeatedly between two options. Some studies have tried to recover consistent preferences from inconsistent choices, for example Harrison et al. (2007), used first switch from a safe lottery to a risky lottery as a lower bound and the last safe choice as a upper bound for relative risk aversion. This may happen because individuals are indifferent between the options. However, most probably such inconsistent choices are made by mistake or misunderstanding and then no consistent preferences can be recovered from such behavior. I eliminate the subjects that made inconsistent choices in either risk or time preference task. This leaves us with a consistent dataset of 92 individuals out of 97 participants.

The dataset of experiment consists of 92 observations, where 44 (47.83%) of them are males and 48 (52.17%) are females. Age of participants is ranging from 19 to 35, where most of the subjects are in a range of 21 – 24 years old. Participants are randomly assigned to positive (48.91%) or negative (51.09%) mood treatment and at the same time to broad (45.65%) or narrow (54.35%) framing treatment, which leads to 2 x 2 design of the experiment. Below in the table 1 it is demonstrated the distribution of subjects into different treatment groups by gender.

Table 1. Distribution of participants being in two treatments by gender

Treatment group	Total	Male	Female
Positive mood and broad framing	21	8	13
Positive mood and narrow framing	24	11	13
Negative mood and broad framing	21	12	9
Negative mood and narrow framing	26	13	13

People of 18 different nationalities participated in the experiment. Two biggest groups according to the nationality are Chinese (41 participants) and Dutch (22 participants), that constitute 44.57% and 23.91% of the sample respectively. According to nationality I divided participants into two groups Asians (53.33%) and Europeans (46.67%). All subjects are students of bachelor or master (premaster, Master of Science or Research Master) programs, 46 (50.00%) bachelor students and 46 (50.00%) studying one of the master programs. Most of the subjects are studying economics (29 participants), business (16 participants), finance (12 participants) and econometrics (11 participants). Based on the studying programme I grouped all the students into 3 groups: economics, business and others. Economics students (participants studying economics and econometrics) make 40 participants (43.48%), business students (participants studying business and management) constitute 23 participants (25.00%) and other students, who study finance, marketing, accounting, law and other programmes make the rest 29 participants (31.52%).

Table 2 below shows some descriptive statistics of risk and time preference variables, demographics, mood, income and wealth variables (description of variables can be found in appendix D).

Table 2. Descriptive statistics

Variable	Mean	Median	Standard deviation
Number of certain choices	11.68	11	2.79
Number of early choices 1	9.63	10	6.84
Number of early choices 2	5.86	4	6.30
Age	22.96	23	2.36
Fraction male	0.48	0	0.50
Score for feeling	6.48	7	2.13
Positive PANAS score	25.72	25.5	6.73
Negative PANAS score	17.66	17	6.56
Minimum expected income	7162.68	6000	4442.82
Maximum expected income	24747.78	10000	104604.4
Average expected income	15989.47	8875	52412.84
Range of expected income	17516.62	4000	104569.50
Probability of income distribution	48.43	50	22.54
Franction of assets group	3.16	3	1.43

The *number of certain choices* denotes how many certain choices are made in a risky choice task, the *number of early choice 1* and the *number of early choice 2* denote number of times a sooner payment is chosen in the first and the second time preference task respectively. From

the table we can see that subjects are more impatient when they have to choose between today and delayed payment than when they have to choose between two delayed payments which is in-line with the quasi-hyperbolic discounting model. *Feeling*, *positive* and *negative PANAS* scores show the mood of participants after the mood induction. The maximum value of *feeling* is 10 and the maximum value of each of the PANAS is 50. From the table below we see that mean and median positive PANAS score is higher than the score for negative PANAS, thus positive emotions prevailed more in the sample than the negative ones. *Average expected income* is calculated by formula (Xmin + Xmax)/2. Where *Xmin* and *Xmax* is a self-reported expected minimum and maximum of income over the next twelve months. The median participant has 9000 euros as average of expected income. *Range of expected income* is denoted by formula Xmax – Xmin. 2 out of 92 subjects (2.17%) reported that they do not face income uncertainty, that is their reported minimum and maximum expected income are equal. The median participant's range of expected income is 4000 euros. *Probability* of income distribution is a variable that denotes a subjective probability that income during next 12 months will be higher than (Xmin + Xmax)/2. Twenty six participants (29.55%) stated that there is a 50 percent probability of their income being higher than reported expected average, twenty nine (32.95%) though that probability of this is less than 50 percent and thirty three (37.50%) assumed there is more than 50 percent probability for expected income to be higher than the expected average. Fraction of *assets* group is a variable that assigns individuals into an asset group, where a first group means that individual has less than 500 euros of savings, a second group means 500 – 1000 euros of savings, a third group denotes 1500 – 3000 euros of savings, a forth group is 3000 – 45000 euros and a fifth group means more than 4500 euros of savings. Mean and median subject belongs to the group of 1500 – 3000 euros of savings.

I check whether mood induction was successful by comparing responses about how individuals feel (evaluation of general mood and positive and negative PANAS) in positive and negative mood induction treatment. The mean score of positive PANAS in a positive mood treatment is 28.27 and in a negative mood treatment it is 23.27; the mean score for negative PANAS is 15.31 and 19.91 in a positive and negative mood treatments respectively. The mean score for general mood (variable *feeling*) in positive affection treatment is 7.64 and it is 5.40 in a negative mood treatment. This shows that mood differs in different treatments. In addition to that I perform the Wilcoxon-Mann-Whitney test. The probabilities of this test for all three variables are smaller than 0.0007. Thus, I conclude that mood in positive and

negative affect treatments is statistically different and the mood induction procedure was successful.

The variables of interest in this study are number of safe choices in a risky choice task and number of early choices in intertemporal choice tasks. Below I discuss those variables more extensively.

The determinant of risk preference in a risky choice task is a number of certain choices among the 20 choices that participants of the experiment have to make. One of the participants chose a lottery in all decisions and 2 subjects picked always a sure amount. Most of the individuals have chosen sure payment for 10 – 13 times (in total 73.91% of participants). In the 10^{th} row of a table lottery has the same expected payoff as a sure amount offered, thus individuals that chose a certain amount for 10 or 11 times can be considered as risk neutral, there are 39 (42.39%) such agents. 42 individuals who picked sure payment more than 11 times can be considered as risk averse (45.65%) and 11 participants who selected sure amount for less than 10 times are risk lovers (11.96%).

The mean number of safe choice in the risk preference task in different treatment groups I present below in a table 3.

Table 3. Mean number of certain choice in the risk preference task

Nr. certain choice	Narrow framing	Broad framing	Mean
Positive mood	11.88	10.62	11.29
Negative mood	12.00	12.14	12.06
Mean	11.94	11.38	

From the table above, we can see that mean number of certain choices differ most in broad framing group when comparing subjects in a negative (mean is 10.62) and in a positive (mean is 12.14) mood induction treatment. In a narrow framing treatment preferences are very similar, whereas in a broad framing treatment they differ more depending on a mood. Even though the difference is not that big, but on average individuals that are in a positive mood take sure amount less times, that is positive mood makes subjects to take more risk. The ones that are induced to think broader on average act more risky compared to the ones that do not have an access to the background risks. These results are in-line with my hypothesis that positive mood and broad framing makes individuals act more risky. Moreover, as I expected

subjects in both positive mood and broad framing treatments take most risk among all the participants.

I study whether there is a significant difference of the variables of interest between the treatments. That is, I test whether a number of safe choices in risky choice task and a number of early choices in both intertemporal choice tasks are statistically different in positive/negative mood and broad/narrow framing treatments. The skewness/kurtosis test showed that the null hypothesis, which states that the variable is normally distributed, is rejected for all three variables. Thus, I use the Wilcoxon-Mann-Whitney test, which is a non-parametric test to compare two independent samples.

Table 4 below demonstrates probabilities of the Wilcoxon-Mann-Whitney test, this test analyze whether the number of certain choices is different in different treatment group (positive/negative treatment, narrow/broad framing treatment and the interaction of positive mood and broad framing).

Table 4. Probabilities of the Wilcoxon-Mann-Whitney test for number of certain choice

Treatment groups	Prob > |z|
Positive/negative mood	0.4568
Narrow/broad framing	0.6176
Positive mood x Broad framing	0.2971

We got that mood and framing effect influence risk preferences to the direction as it was expected, however from the probabilities of Wilcocon-Mann-Whitney test we get that differences in the treatment groups are not statistically significant.

Further, I discuss the results obtained for time preferences. In order to analyze time preferences I asked individuals to make choices between an amount of money today and after one month, as well to choose between two delayed payments – after three and four months. Dependent variable in both cases is a number of times an individual chooses earlier payment.

I will start my analysis by discussing the results of the task where subjects had to choose between the lower payment today and higher payment after one month. In the sample there were 2 individuals (2.17%) that chose always delayed payment, 12 individuals (13.04%) who picked early payment for the first choice and delayed payments for the rest of the choices (in the first row of the table early and delayed payments are equal) and there were 14 individuals

(15.22%) who always picked the early payment. Twelve subjects (13.04%) switched to delayed payment around the middle of the table (made 10 early choices).

The mean number of early choice of this intertemporal choice task in different treatment groups is demonstrated in table 5 below.

Table 5. Mean number of early choice in the first time preference task

Nr. early choice 1	Narrow framing	Broad framing	Mean
Positive mood	8.50	11.62	9.96
Negative mood	10.00	8.48	9.32
Mean	9.28	10.05	

From the table above, we get that the biggest difference in a mean number of early choices is in broad framing treatment between positive and negative mood. The most similar preferences are for individuals who are in positive mood and narrow framing treatment compared to those who are in a negative mood and broad framing treatment. As we can see from the table above individuals in a broad framing treatment on average choose slightly more times early payments than individuals in a narrow framing treatment. This means that inducing people to think broader makes them less patient which is in accordance to my hypothesis. However, participants in a positive mood treatment act slightly less patient compared to the ones in a negative mood treatment which is the opposite of what I have expected (however, it is in accordance to the results obtained by Drichoutis and Nayga, 2010). We get that individuals who are both in a positive affect and are also induced to frame the situation broad are the most impatient compared to other treatment groups. Thus, inducing individuals to think about pre-existing risks may have stronger effect if they are in a positive mood.

I check if the differences among the treatments are statistically significant, for this I use the Wilcoxon-Mann-Whitney test.

Table 6. Probabilities of the Wilcoxon-Mann-Whitney test for number of early choice in the first intertemporal choice task

Treatment groups	Prob > |z|
Positive/negative mood	0.6206
Narrow/broad framing	0.5945
Positive mood x Broad framing	0.1085

From the table 6 above we get that differences in the treatments are not statistically significant. However, for the interaction term of positive mood and broad framing the probability is very close to being significant at 10% significance level.

Hereby, I analyse the results obtained in the second task of time preference determination, where individuals had to choose between the lower payment after 3 months and a higher payment after 4 months. Among all the participants there were 11 individuals (11.96%) that chose always delayed payment, 26 individuals (28.26%) that picked early payment for the first choice and delayed payments for the rest of the choices (in the first row of the table early and delayed payments were equal) and 8 individuals (8.70%) that always preferred the early payment.

The mean number of early choice in intertemporal choice task 2 (choice between two delayed payments) in different treatment groups is demonstrated in table 7.

Table 7. Mean number of early choice in the second time preference task

Nr. early choice 2	Narrow framing	Broad framing	Mean
Positive mood	3.88	8.62	6.09
Negative mood	6.12	5.05	5.64
Mean	5.04	6.83	

Number of early choice in a two delayed payments task differs most between individuals in a positive mood and narrow framing treatment compared to the individuals in a positive mood and broad framing treatment. Preferences for individuals in a positive mood treatment are more affected by framing effect than for the ones in a negative mood treatment. Moreover, the differences of the number of early choices in a broad framing treatment is slightly bigger than in a narrow framing treatment when comparing subjects in different moods. As it was hypothesized individuals in broad framing treatment on average are a bit less patient. However, opposite to what was expected we find that positive mood makes subjects slightly less patient compared to individuals in negative mood (confirms results of Drichoutis and Nayga, 2010).

The statistical significance of the differences among treatments is studied using Wilcoxon-Mann-Whitney test. Results are demonstrated in a table 8 below.

Table 8. Probabilities of the Wilcoxon-Mann-Whitney test for number of early choice in the second intertemporal choice task

Treatment groups	Prob > |z|
Positive/negative mood	0.5499
Narrow/broad framing	0.2255
Positive mood x Broad framing	0.0227

We get that difference in a mean number of early choice is statistically significant when comparing individuals who are in both positive mood and broad framing treatment with others. Therefore, reminding individuals about the pre-existing risks might influence their time preferences; particularly make them impatient, but just if they are in a positive mood.

Comparing the number of early choice in both time preference tasks (table 5 and table 7) we can see that the pattern is the same. In the narrow framing treatment number of early choices increases with a negative mood, whereas in a broad framing treatment it increases with a positive mood. Individuals that are both in a positive mood and in a broad framing treatment demonstrate least patience in both interteporal choice tasks. On average individuals in the first intertemporal choice task demonstrate more impatience which suggests the dynamic inconsistencies proposed by the quasi-hyperbolic discounting model. The pattern of mood and framing effect's influence in both tasks is similar. However, it does not seem that mood or framing affects time preferences in the first task more than in the second. The hypothesis that mood and framing effect should affect discount factor between now and future more than the discount factor between two future periods was not confirmed by the data of experiment.

In the following section I provide the results of the risk and time preference's regression analysis.

5.2 Regressions

In the following sections regression analysis of risk and time preferences is provided. In our sample data is censored as individuals both in risk and time preference tasks can choose from zero to twenty times a certain or an early payment respectively. Especially in time preference tasks there are quite a few individuals who appeared to be on the lower or upper bound. Consequently, the Tobit model is used for the analysis.

Tobit model when dependent variable y_i is censored from below and above at the same time can be expressed as follows:

$$y_i = \begin{cases} y_i^* & \text{if } y_L < y_i^* < y_U \\ y_L & \text{if } y_i^* \leq y_L \\ y_U & \text{if } y_i^* \geq y_U \end{cases}$$

Where the minimum choice of certain or early payments is zero (the lower bound) and the maximum choice is twenty (the upper bound).

Further, section 5.2.1 analyzes the factors that influence risk aversion and section 5.2.2. discusses what affects time preferences when the choice has to be made between today and the future, and between two future periods.

5.2.1 Regressions for risk preferences

To analyze how various factors influence risk preferences I ran few Tobit models for a number of certain choices in risk preference task including different independent variables. I will shortly describe how I built up the models demonstrated in a table 9 below.

I have started the analysis by regressing number of certain choices on dummy variables denoting treatment groups: positive, negative and interaction of both. This is demonstrated in the first model. Second model differs from the first one as in addition it contains demographics (variable *age* and dummies: *male, Asian*, *bachelor*, *economics* and *business*). In the third model I introduce background risk variables: *high average*, *high range*, *probability* and *rich*. I assume that variables reminding about the financial situation and income uncertainty may broaden the individuals' standpoint. It is possible that the framing effect is present just if individuals are actually facing income uncertainty. Because of that I also include the interaction terms of variable *broad* with variables *high average* and *high range*. This is demonstrated in the fourth model. In the fifth regression I introduce the multiplication of three variables: *positive* and *broad* with both *high average* and *high range*, also all pairwise interactions of those variables. Sixth regression is the further extension of the model where I introduce the variables of actual mood – the scores of positive and negative PANAS.

The significance of variables is changing among the models and this could happen because of the correlation among the independent variables. In the appendix E I provide the table of pairwise correlation coefficients of all independent variables I used in the models. Some of the variables are correlated as they are included in few terms, and interaction terms are correlated with the individual terms of the product. Moreover, I have noticed that there is quite strong correlation between variable *high average* and *high range* and even stronger correlation between interaction terms that include whether *high average* or *high range.* Consequently, I added seventh regression that does not have variable *high average* and all interaction variables that include *high average*. In the last model I have chosen to skip *high average* as I assume that the uncertainty of future income might have higher impact on risk and time preferences that the magnitude of expected income. All seven Tobit regressions are demonstrated in table 9 below.

Table 9. Regressions for risk preferences

Dependent variable: number of certain choices in a risk preference task			
	(1)	(2)	(3)
	No controls	Demographics	Demographics
Positive	-0.125	-0.338	-0.382
	(0.791)	(0.824)	(0.813)
Broad	0.222	0.095	-0.085
	(0.821)	(0.840)	(0.886)
Positive x Broad	-1.510	-1.286	-1.202
	(1.171)	(1.221)	(1.177)
High average			-0.725
			(0.703)
High range			0.376
			(0.712)
Probability			0.017
			(0.014)
Rich			0.789
			(0.594)
Number of observations	92	91	85
Pseudo R^2	0.010	0.015	0.026

Table 9 continued

Dependent variable: number of certain choices in a risk preference task				
	(4)	(5)	(6)	(7)
	Demographics	Demographics	Demographics	Demographics
Positive	-0.414	-0.392	0.342	0.113
	(0.814)	(1.033)	(1.000)	(0.884)
Broad	0.137	-3.176**	-3.130**	-1.547
	(1.157)	(1.474)	(1.470)	(1.174)
Positive x Broad	-1.167	3.519*	3.072	1.361
	(1.200)	(1.899)	(1.875)	(1.564)
High average	-0.789	0.680	-0.044	
	(0.921)	(1.314)	(1.146)	
High range	0.635	-0.638	0.501	0.211
	(0.904)	(1.382)	(0.846)	(0.785)
Probability	0.017	0.008	0.006	0.008
	(0.014)	(0.013)	(0.014)	(0.014)
Rich	0.796	0.456	0.389	0.517
	(0.603)	(0.576)	(0.575)	(0.587)
Broad x High average	0.158	2.377	3.233	
	(1.451)	(2.142)	(2.028)	
Broad x High range	-0.600	1.628	0.662	2.145
	(1.346)	(1.902)	(1.604)	(1.476)
Positive x High average		-2.485	-1.154	
		(1.696)	(1.462)	
Positive x High range		1.925	0.000	0.000
		(1.765)	(0.000)	(0.000)
Positive x Broad x High average		-2.753	-4.086	
		(2.779)	(2.607)	
Positive x Broad x High range		-3.643	-1.578	-3.983**
		(2.657)	(1.932)	(1.680)
Positive Panas			-0.060	-0.073
			(0.047)	(0.048)
Negative Panas			0.004	-0.007
			(0.047)	(0.048)
Number of observations	85	85	85	85
Pseudo R^2	0.026	0.060	0.061	0.045

Note. ***, **, * denote significance at 1%, 5%, 10% level, standard errors in parenthesis

Demographics are not demonstrated in the table above, however I will discuss them shortly. Regressions showed that variable *male* has a negative and variable *age* has a positive impact on number of certain choices. Thus, men and younger individuals tend to take more risk. This is reasonable as women usually are more risk averse than men and younger people have a

tendency to take more risky actions. Bachelor students are found to be less risk prone compared to the master students. This result might seem strange but after more detailed investigation of the data I found that most bachelor students in the sample are 23-24 years old, whereas most master students are 21-22 years old. However, the effect of the demographics is not statistically significant, except for variable bachelor in the sixth model.

Variables of interest in regressions are the ones accounting for mood and framing treatments. We get that variable *positive* is not significant and because of relatively high standard errors the effect cannot be interpreted. The sign of the coefficient next to the variable *broad* is not that stable among the regression. When I include variables accounting for the background risks it becomes negative and significant, which means that individuals induced to think broader on average tend to take more risk keeping other factors constant and this is in-line with my hypothesis and the results of Guiso (2009). The interaction of *positive* and *broad* has a negative sign in the first four models and then it becomes positive in the last three models; the change of the sign may occur because interaction terms are correlated with single variables and this might lead to non robust sign. Significance of this interaction term means that risk preferences of individuals in a positive mood are affected by the framing effect more than preferences of individuals in a negative mood. This variable is significant in the fifth model.

The sign of high average and high range is as expected: high expected average income makes individuals to take more risk, whereas high uncertainty of future income makes them risk averse. However, those variables are not statistically significant.

5.2.2 Regressions for time preferences

In order to analyze what influence time preferences I ran few Tobit models, regressions were built in the same way as the ones for risk preference determination.

I start the analysis of time preferences by the regressions for number of early choices in the first intertemporal choice task. Seven Tobit models are demonstrated in the table 10 below.

Table 10. Regressions for the first intertemporal choice task

Dependent variable: number of early choices in an time preference task 1			
	(1)	(2)	(3)
	No controls	Demographics	Demographics
Positive	-1.646	-0.888	0.934
	(2.260)	(2.344)	(2.442)
Broad	-1.621	-1.717	-3.275
	(2.355)	(2.398)	(2.640)
Positive x Broad	4.720	4.563	5.979*
	(3.356)	(3.474)	(3.509)
High average			2.004
			(2.079)
High range			-1.599
			(2.106)
Probability			-0.055
			(0.041)
Rich			-0.798
			(1.780)
Number of observations	92	91	85
Pseudo R^2	0.004	0.010	0.024

Table 10 continued

Dependent variable: number of early choices in an time preference task 1				
	(4)	(5)	(6)	(7)
	Demographics	Demographics	Demographics	Demographics
Positive	1.268	-0.291	0.438	0.976
	(2.407)	(3.185)	(3.390)	(3.421)
Broad	-6.350*	-13.069***	-13.142***	-9.219**
	(3.412)	(4.455)	(4.408)	(3.607)
Positive x Broad	5.882	16.576***	17.082***	12.298**
	(3.525)	(5.748)	(5.695)	(5.023)
High average	2.091	-1.63	-2.697	
	(2.672)	(3.935)	(3.982)	
High range	-4.288	-2.250	-0.315	-2.619
	(2.622)	(4.161)	(4.333)	(3.499)
Probability	-0.061	-0.067*	-0.057	-0.048
	(0.041)	(0.040)	(0.040)	(0.039)
Rich	-1.014	-2.025	-1.967	-1.623
	(1.780)	(1.763)	(1.749)	(1.755)
Broad x High average	-0.182	7.585	9.482	
	(4.225)	(6.436)	(6.528)	
Broad x High range	6.072	8.870	5.515	10.139*
	(3.898)	(5.713)	(6.095)	(5.125)
Positive x High average		6.337	7.081	
		(5.078)	(5.122)	
Positive x High range		-2.842	-5.227	-0.943
		(5.327)	(5.571)	(4.683)
Positive x Broad x High average		-10.924	-13.143	
		(8.368)	(8.451)	
Positive x Broad x High range		-6.519	-3.465	-9.698
		(7.995)	(8.274)	(6.908)
Positive Panas			0.118	0.150
			(0.139)	(0.141)
Negative Panas			0.172	0.119
			(0.152)	(0.151)
Number of observations	85	85	85	85
Pseudo R^2	0.030	0.043	0.048	0.041

Note. ***, **, * denote significance at 1%, 5%, 10% level, standard errors in parenthesis

For the first time preference task I got that older individuals are more patient than younger ones, which is reasonable Bachelor students, which appear in the sample to be on average older than master students, are acting more patiently compared to the students studying one of the master programs. Asians are found to be more patient than Europeans. Students who study

economics or business are more impatient than student studying other programmes. From the variables discussed above *Asian* and *economics* are significant in most of the regressions.

Variable *positive* is not significant in the models and does not have a robust direction of the effect. Reminding individuals about the pre-existing risks they are facing (variable *broad*) makes them on average more impatient keeping other factors constant, which is also in-line with the hypothesis stated in the previous chapter. In the last four models variable *broad* is statistically significant. The interaction of variables *positive* and *broad* is statistically significant in most of the models, especially when variables accounting for pre-existing risks are included. Even in the models where this interaction term is not significant standard errors are relatively small and coefficients are close to being significant. The sign of interaction term is positive. The result shows that in a narrow framing treatment mood does not have an effect, however if individuals are in a broad framing treatment then mood influences preference, particularly positive mood makes individuals less patient. The same pattern of effect can be seen in table 5 where average number of early choices in different treatments is demonstrated.

Hereby, I will discuss the result obtained from Tobit regressions for the number of early payments in a second intertemporal choice task. The results are demonstrated in the table 11 below.

Table 11. Regressions for the second intertemporal choice task.

Dependent variable: number of early choices in an time preference task 2			
	(1)	(2)	(3)
	No controls	Demographics	Demographics
Positive	-2.784	-3.666*	-3.841*
	(2.115)	(2.162)	(2.066)
Broad	-0.833	-0.441	0.924
	(2.187)	(2.189)	(2.1917)
Positive x Broad	6.497**	6.452**	5.114*
	(3.126)	(3.183)	(2.917)
High average			-6.847***
			(1.811)
High range			4.971***
			(1.811)
Probability			0.006
			(0.034)
Rich			1.457
			(1.471)
Number of observations	92	91	85
Pseudo R^2	0.012	0.027	0.059

Table 11 continued

Dependent variable: number of early choices in an time preference task 2				
	(4)	(5)	(6)	(7)
	Demographics	Demographics	Demographics	Demographics
Positive	-3.531*	-3.800	-5.046*	-4.617
	(2.036)	(2.733)	(2.905)	(3.141)
Broad	0.970	-1.661	-1.454	-4.287
	(2.812)	(3.847)	(3.799)	(3.275)
Positive x Broad	4.316	8.017	8.030	10.554**
	(2.946)	(4.962)	(4.903)	(4.583)
High average	-5.109**	-7.169*	-6.936*	
	(2.344)	(3.633)	(3.693)	
High range	3.179	4.882	4.766	-0.314
	(2.270)	(3.743)	(3.902)	(3.211)
Probability	0.009	0.006	0.013	-0.018
	(0.034)	(0.034)	(0.034)	(0.036)
Rich	1.608	1.201	1.014	0.749
	(1.469)	(1.513)	(1.500)	(1.598)
Broad x High average	-3.978	0.822	0.448	
	(3.630)	(5.804)	(5.878)	
Broad x High range	4.369	3.348	3.515	6.632
	(3.349)	(5.103)	(5.427)	(4.711)
Positive x High average		3.374	2.655	
		(4.621)	(4.643)	
Positive x High range		-2.544	-2.222	1.306
		(4.751)	(4.954)	(4.332)
Positive x Broad x High average		-7.192	-6.770	
		(7.434)	(7.507)	
Positive x Broad x High range		1.342	0.544	-7.662
			(7.297)	(6.337)
Positive Panas			0.187	0.135
			(0.121)	(0.130)
Negative Panas			-0.104	-0.140
		7.050	(0.132)	(0.141)
Number of observations	85	85	85	85
Pseudo R^2	0.063	0.065	0.070	0.039

Note. ***, **, * denote significance at 1%, 5%, 10% level, standard errors in parenthesis

In the second intertemporal choice task I found that men are more impatient than women and this result is statistically significant. Opposite from the result in a first intertemporal choice task, bachelor students appeared to be more impatient than master students, and economics and business students demonstrated more patience compared to students of other programmes. However, those coefficients are not statistically significant.

The coefficient on a mood treatment (variable *positive*) is negative, which means that individuals who are in a positive mood on average tend to choose early payments less often than individuals in a negative mood keeping other factors constant. This is in-line to my hypothesis that people affected by a positive mood are more patient. In most of the regressions the coefficient next to *positive* is statistically significant at 10% significance level. We see that positive mood makes individuals patient but if they are also assigned to the broad framing treatment this joint effect at the end makes them impatient (combined effect of *broad* and the interaction term *positive* x *broad*). The sign of *positive x broad* and *positive* is opposite, but the magnitude of the interaction term is bigger, thus, the impact of both effects leads to more impatience.

Broad is not significant in the models demonstrated in a table above. The interaction between *positive* and *broad* has a positive sign in all regressions and in most of the regressions it is significant, in case it is not significant standard errors are relatively small and coefficients are close to being significant. This means that inducing individuals to think broad has an influence only if subjects are in a positive mood (positive mood for individuals who are reminded about their background risks leads to more impatience). In the previous section the Wilcoxon-Mann-Whitney test confirmed the same conclusion, the test showed that average number of early choices is statistically different for people who are in both positive mood and broad framing treatment compared to the others. The same direction of the effect can be observed in table 7 where I demonstrate the average number of early choices in different treatment groups.

In some regressions variable high average is significant and has a negative sign, which means that the higher are expected income the more patient individual is.

Comparing the result obtained for the first and the second intertemporal choice task we see that most of the variables of interest go to the same directions, however magnitudes of coefficients seems to be bigger in the second intertemporal choice task.

The main results obtained from the regression analysis, is that background mood and risks appear to have a bigger impact on time preferences than on risk preferences. Choice between today and future is affected by framing effect and the mood an effect just if individuals are induced to think about their pre-existing risks. For the choice between two delayed payments we get that mood affects the preference and framing effect is statistically significant just if individuals are in a positive mood.

6. CONCLUSIONS

This thesis is an experimental study designed to analyze the effect of background mood and pre-existing risks on decision making, particularly on risk and time preferences.

Previous research studied mood effect on risk and time preferences; however it concentrated more on risk references. What is more, this study shows that inducing individuals to think about the pre-existing risks may influence not only risk preferences but also time preferences, which was not found in the previous research. The results demonstrate that time preferences appear to be affected by background mood and pre-existing risks, whereas risk preferences are almost unaffected by those factors. For the first intertemporal choice task (choice between payments today and in the future) I found that inducing individuals to think broad affects their time discounting, moreover mood has an effect on time preferences just if individuals are in a broad framing treatment. In the second intertemporal choice task (choice between two delayed payments) mood has a significant effect: on average positive mood makes individuals more patient keeping other factors constant. Framing effect appears to influence the choice just if individuals are induced to a positive mood. In both intertemporal choice tasks interaction of mood and framing effect is statistically significant.

The contribution of this paper to the literature is that it is the first as far as it is known to me that attempt to analyze the interaction effect of background mood and pre-existing risks on decision making. Moreover, it contributed to the literature about the time preferences which is still scarce compared to the literature on risk preferences. The topic of framing effect on time preferences has not been analyzed extensively in the previous research. The advantage of this study compared to many other studies is that it used real and not hypothetical payments in the experiment. This allows us to relate actual choices with risk and time preferences.

The affect of mood and background risk on decision making can be important for policy implications. In the experiment people's mood changed after watching a short episode from a movie, they were induced to think broader just by asking some questions about the future income distribution and this in turn affected their decisions. In everyday life people watch movies, listen to the news and are exposed to many other shocks which may induce a mild positive or negative affect. People are constantly stimulated by the environment and their preferences are perturbed regularly. Individuals might even not realize themselves about the

fact that their decisions are influenced by small shocks they are facing each day. The experiment shows that creation of particular atmosphere and bringing some thoughts to individual's mind may influence the decisions and preferences in the upcoming dilemmas.

What is more, when researching risk and time preferences it is important to take into account that the mood and thoughts that appear in the mind of participants just before the experiment may be partly responsible for the results. Thus, in the experimental studies mood should be neutralized and mind "cleared" before determination of risk and time preferences.

Policy makers may use affective shocks or remind about the income risks in order to affect our choice in important decisions related to our earnings, spending, consumption and healthcare. For our well-being the policy makers can manipulate our behavior and implement "libertarian paternalism" using small nudges such as reminding of our income uncertainties or mildly influencing our mood.

These topics have not been research extensively yet and further research could be done in the future. An interesting extension of the study could be to perform a similar experiment on non-students. Working people may have different preferences and react to the stimulus as mood affection or income uncertainty differently. It could be also checked how decisions taken by individuals in a positive or negative mood differs from the decisions of individuals in a neutral mood. It is possible that both positive and negative mood affect preferences and decisions but the effect of positive mood might not be going to the opposite directions from the effect of negative mood. Thus, it would be interesting to check whether there is an asymmetric effect between positive and negative mood. Asymmetry would imply that there is a different mechanism in which positive and negative mood influence our judgments. The analysis could be also extended by including other factors that may affect risk preferences and intertemporal choice such as regret and thinking mode, which were studied by Guiso (2009), also other elements.

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APPENDIX A

Risk-as-feelings hypothesis

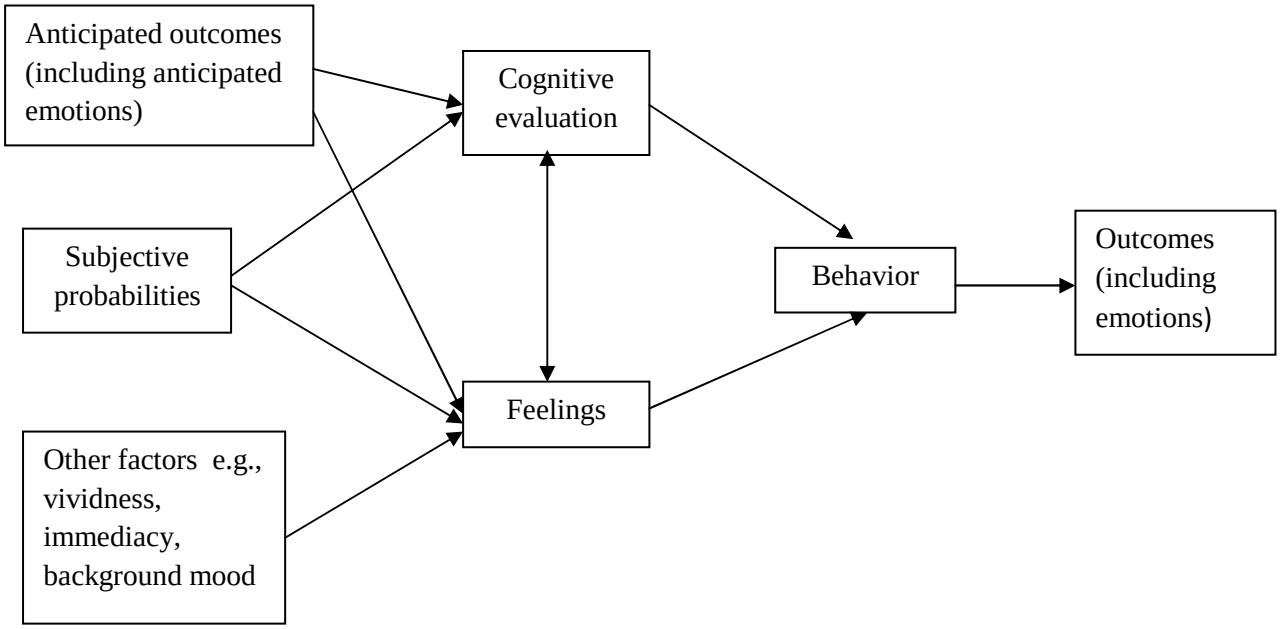


Figure 1. Risk-as-feelings perspective

Source: G. F. Loewenstein, E. U. Weber, C. K. Hsee and N. Welch “Risk as feeling”, 2001, pp. 270.

APPENDIX B

Example of the experiment: negative mood and broad framing treatment

The Experiment

Welcome to our experiment. The experiment consists of two separate and independent parts. The first part is about perceptiveness and the second part is about decisions involving risk.

Please do not talk with other participants during the experiment and do the tasks in the order they are presented.

You can earn money in this experiment. We will give you the money after the experiment. How much money you will earn depends partly on your decisions and partly on chance. That's why it is important that you understand the rules of experiment. If at any point during the experiment you have questions please raise your hand and one of the experiment organizers will come to answer your question.

PART 1

A short video will be shown to you. After that, you will be asked a few questions related to the video.

If you do not have any questions please put on the headset and start the video by clicking the "play" button on the screen.

When you have finished watching the video please take the pile of sheets that is put upside down on the side of your table.

THE EXPERIMENT

Please do not talk with other participants during the experiment and do the tasks in an order they are presented. Raise your hand if you have any questions.

PART 1

Please answer the questions below that are related to the video you just watched.

1) The woman was wearing on her head:
    - o A scarf
    - o A black hat
    - o A yellow hat
    - o Nothing

2) The woman in the video was:
    - o German
    - o Polish
    - o Hungarian
    - o Swedish

3) Which one of her children does Sophie choose to send to the gas chamber:
    - o The boy
    - o The girl
    - o She could not choose

PART 2

Now you are about to start the second experiment. First, we would like to ask you to fill a questionnaire about yourself:

1) I am □ female □ male
2) I am _____ years old
3) My nationality: _____
4) I am studying: □ Bachelor
   - o First year
   - o Second year
   - o Third year

   □ Master of Science

   □ Research Master
   - o First year
   - o Second year

   □ Other: _____
5) My study field: □ Economics

   □ Econometrics

   □ Business

   □ Management

   □ Accounting

   □ Finance

   □ Law

   □ Other: _____
6) At the current moment I feel (evaluate on a scale from 1 to 10)
   _____ where 1 is “very bad” and 10 is “very good”

7) Using a scale from 1 to 5 indicate to what extent you feel the following emotions at the present moment:

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

jittery _____
nervous _____
excited _____
irritable _____
upset _____
guilty _____
proud _____
alert _____
determined _____
active _____

distressed _____
scared _____
enthusiastic _____
interested _____
strong _____
hostile _____
ashamed _____
inspired _____
attentive _____
afraid _____

8) Please consider the income (salary, scholarship, government and parents support, and other sources) you expect to receive over the next 12 months:
   - Over the next 12 months I expect to receive at least _____ euro (Xmin)
   - Over the next 12 months I expect to receive at most _____ euro (Xmax)
   - The probability that my income will be greater than the amount X = (Xmin + Xmax)/2 is _____ percent.

9) How much assets (money in your bank account and other savings) you have?
   - ☐ less than 500 euro
   - ☐ 500-1500 euro
   - ☐ 1500-3000 euro
   - ☐ 3000-4500 euro
   - ☐ more than 4500 euro

Now you will be asked to make some choices in the following tasks.

In the decision sheet on the following page you are asked to make twenty decisions. Each decision is a paired choice between a lottery and a certain payment. On the left side of the table there is a lottery with 50% chance to win 10 euros and 50% chance to get nothing, on the right side of the table are certain payments that are increasing successively. You are asked to choose between the lottery and the certain payment in each row by checking boxes on the left or right side.

Before you start making your choices, please let me explain how these choices will affect your earnings for this part of the experiment.

One out of 20 choices you make will be actually paid. A throw of a fair 20-sided die determines which choice will be actually paid out. Depending on the choice you made you will get a certain amount paid to you or you will participate in the lottery. The payment in the lottery will be decided by rolling a fair 6-sided die, where even number of points means that you win 10 euro and odd number of points means you get nothing.

If you have any questions please raise your hand. If you do not have any questions you may begin making your choices in the table on the following sheet.

Table 1

1	50% chance of winning €10 and 50% chance of winning €0	○	or	○	0.50 euro for sure
2	50% chance of winning €10 and 50% chance of winning €0	○	or	○	1 euro for sure
3	50% chance of winning €10 and 50% chance of winning €0	○	or	○	1.50 euro for sure
4	50% chance of winning €10 and 50% chance of winning €0	○	or	○	2 euro for sure
5	50% chance of winning €10 and 50% chance of winning €0	○	or	○	2.50 euro for sure
6	50% chance of winning €10 and 50% chance of winning €0	○	or	○	3 euro for sure
7	50% chance of winning €10 and 50% chance of winning €0	○	or	○	3.50 euro for sure
8	50% chance of winning €10 and 50% chance of winning €0	○	or	○	4 euro for sure
9	50% chance of winning €10 and 50% chance of winning €0	○	or	○	4.50 euro for sure
10	50% chance of winning €10 and 50% chance of winning €0	○	or	○	5 euro for sure
11	50% chance of winning €10 and 50% chance of winning €0	○	or	○	5.50 euro for sure
12	50% chance of winning €10 and 50% chance of winning €0	○	or	○	6 euro for sure
13	50% chance of winning €10 and 50% chance of winning €0	○	or	○	6.50 euro for sure
14	50% chance of winning €10 and 50% chance of winning €0	○	or	○	7 euro for sure
15	50% chance of winning €10 and 50% chance of winning €0	○	or	○	7.50 euro for sure
16	50% chance of winning €10 and 50% chance of winning €0	○	or	○	8 euro for sure
17	50% chance of winning €10 and 50% chance of winning €0	○	or	○	8.50 euro for sure
18	50% chance of winning €10 and 50% chance of winning €0	○	or	○	9 euro for sure
19	50% chance of winning €10 and 50% chance of winning €0	○	or	○	9.50 euro for sure
20	50% chance of winning €10 and 50% chance of winning €0	○	or	○	10 euro for sure

Now you turn to the second task.

You will have to decide whether you want to get a certain amount of money at an earlier date or another, possibly larger, amount at a later date.

In this part you have to choose between two payment options: option A and option B. Option A will pay 15 euros today and option B will pay 15+X euros in 1 month, where X is different in each situation.

Each participant in this part of the study has a chance to earn an additional sum of money. You have a 1 in 20 chance to be selected for this. Whether you actually receive an additional amount of money depends on a fair 20-sided die throw. If you throw number equal to "1" you are selected for payment. If you are selected for payment, then you will have to throw a fair 20-sided die again and the number will correspond to one of the 20 choice options you made. The payment you receive is then in accordance with the preference you have indicated for the choice situation concerned. If option A was chosen then you will get money today right after the experiment and if option B was chosen the money will be transferred into your bank account after 1 month from today.

If you have any questions please raise your hand. If you do not have any questions you may begin making your choices in the table on the following sheet.

Table 2

Decision	Payment Option A Pays amount below **today**			Payment Option B Pays amount below **in 1 month**
1	€ 15	□	□	€ 15
2	€ 15	□	□	€ 15.30
3	€ 15	□	□	€ 15.60
4	€ 15	□	□	€ 15.90
5	€ 15	□	□	€ 16.20
6	€ 15	□	□	€ 16.50
7	€ 15	□	□	€ 16.80
8	€ 15	□	□	€ 17.10
9	€ 15	□	□	€ 17.40
10	€ 15	□	□	€ 17.70
11	€ 15	□	□	€ 18.00
12	€ 15	□	□	€ 18.30
13	€ 15	□	□	€ 18.60
14	€ 15	□	□	€ 18.90
15	€ 15	□	□	€ 19.10
16	€ 15	□	□	€ 19.40
17	€ 15	□	□	€ 19.70
18	€ 15	□	□	€ 20.00
19	€ 15	□	□	€ 20.30
20	€ 15	□	□	€ 20.60

Now you are asked to perform a very similar task. In this part you have to choose between two payment options: option A and option B. Option A will pay 15 euros in 3 months and option B will pay 15+X euros in 4 months, where X is different in each situation.

Each participant in this part of the study has a chance to earn an additional sum of money. You have a 1 in 20 chance to be selected for this. Whether you actually receive an additional amount of money depends on a fair 20-sided die throw. If you throw number equal to "1" you are selected for payment. If you are selected for payment, then you will have to throw a fair 20-sided die again and the number will correspond to one of the 20 choice options you made. The payment you receive is then in accordance with the preference you have indicated for the choice situation concerned. If option A was chosen then the money will be transferred to your bank account in 3 months and if option B was chosen the money will be transferred into your bank account after 4 months from today.

If you have any questions please raise your hand. If you do not have any questions you may begin making your choices in the table on the following sheet.

Table 3

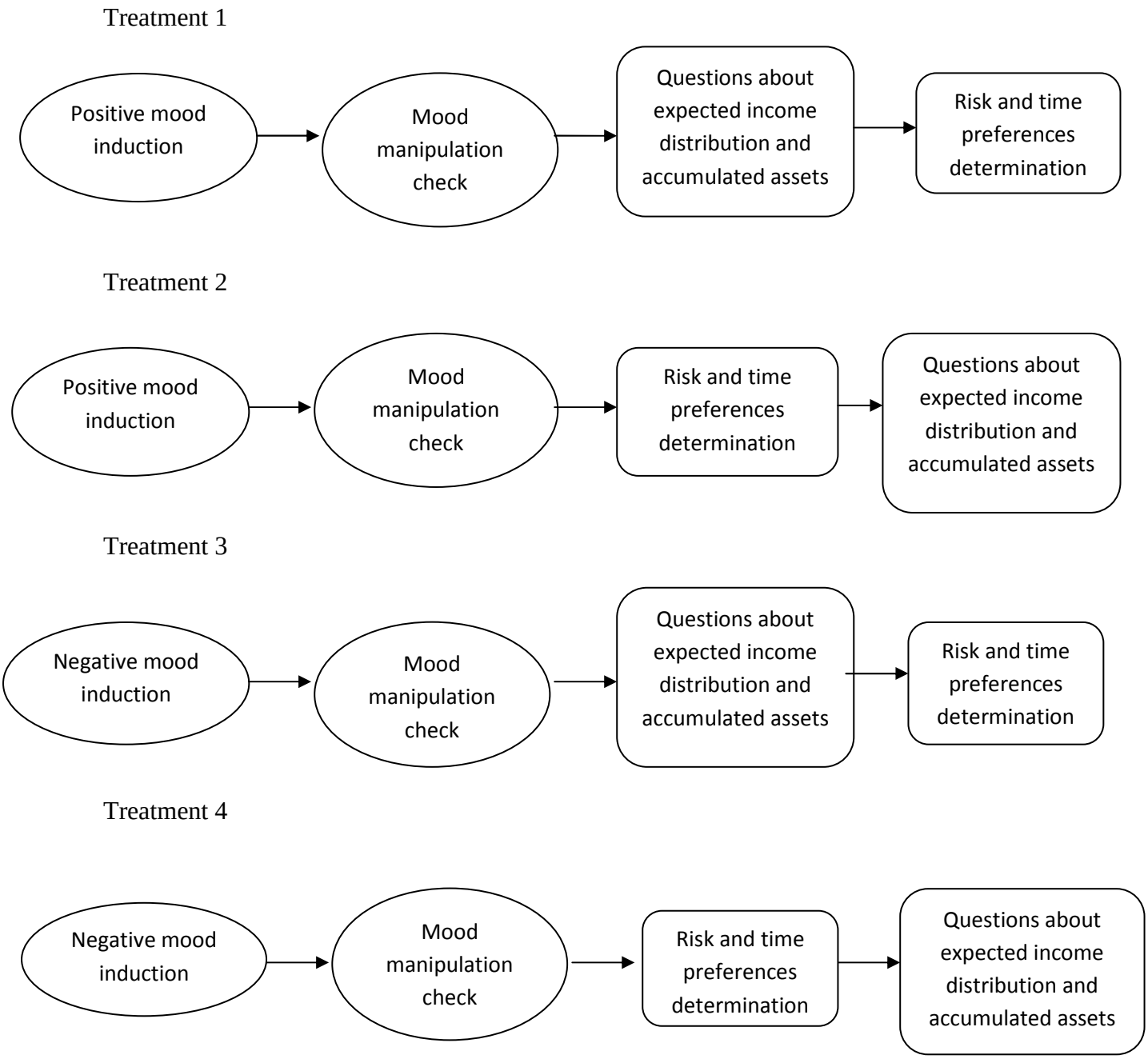
Decision	Payment Option A Pays amount below **in 3 months**			Payment Option B Pays amount below **in 4 months**
1	€ 15	□	□	€ 15
2	€ 15	□	□	€ 15.30
3	€ 15	□	□	€ 15.60
4	€ 15	□	□	€ 15.90
5	€ 15	□	□	€ 16.20
6	€ 15	□	□	€ 16.50
7	€ 15	□	□	€ 16.80
8	€ 15	□	□	€ 17.10
9	€ 15	□	□	€ 17.40
10	€ 15	□	□	€ 17.70
11	€ 15	□	□	€ 18.00
12	€ 15	□	□	€ 18.30
13	€ 15	□	□	€ 18.60
14	€ 15	□	□	€ 18.90
15	€ 15	□	□	€ 19.10
16	€ 15	□	□	€ 19.40
17	€ 15	□	□	€ 19.70
18	€ 15	□	□	€ 20.00
19	€ 15	□	□	€ 20.30
20	€ 15	□	□	€ 20.60

Once you are finished, please turn over your decision sheet and raise your hand.

Thank you for participating in the experiment!

APPENDIX C

Graphical demonstration of the experiment design



APPENDIX D

Description of variables used in regressions

Number of certain choices – number of times when a sure payoff is chosen in a risky choice task

Number of early choices 1 – number of times when an early payoff is chosen in an intertemporal choice task 1

Number of early choices 2 – number of times when an early payoff is chosen in an intertemporal choice task 2

Male - dummy variable, which gets value of one if an individual is a man, and zero otherwise.

Age – the age of individual

Bachelor – dummy variable, which gets value of one if an individual is studying in a Bachelor programme, and zero otherwise.

Master – dummy variable, which gets value of one if an individual is a Premaster, Master of Science or Research Master student, and zero otherwise.

Asian – dummy variable, which gets value of one if an individual is Asian, and zero otherwise.

European – dummy variable, which gets value of one if an individual is European, and zero otherwise.

Economics – dummy variable, which gets value of one if an individual studies economics or econometrics, and zero otherwise.

Business – dummy variable, which gets value of one if an individual studies business or management, and zero otherwise.

Feeling – number denoting current feeling of an individual, ranging from 1 (very bad) to 10 (very good)

Positive PANAS – score of positive PANAS

Negative PANAS – score of negative PANAS

Positive – dummy variable, which gets value of one if an individual is in a positive mood treatment, and zero otherwise.

Broad – dummy variable, which gets value of one if an individual is in a broad framing treatment, and zero otherwise.

Posbroad (or positive x broad) – dummy variable, which gets value of one if an individual is both in a positive mood and broad framing treatments, and zero otherwise.

Rich – dummy variable, which gets value of one if an individual has more than 3000 euros of savings, and zero otherwise.

Probability - probability that expected income over the next twelve months will be higher that (Xmin + Xmax)/2.

Xmin – subjective minimum expected income over next 12 months

Xmax – subjective maximum expected income over next 12 months

Xaverage – average of expected income over next 12 months, (Xmin + Xmax)/2

Xrange – range of expected income over next 12 months, Xmax – Xmin

High average – dummy variable, that gets value of one if the average of expected income over the next 12 months is equal or higher than 9000 euros (where 9000 euros is the median value of the average expected income), and zero otherwise.

High range – dummy variable, that gets value of one if the range of expected income over the next 12 months is equal or higher than 4000 euros (where 4000 euros is the median value of the range of expected income), and zero otherwise.

Broad x High average – dummy variable, that gets value of one if individual is in a broad treatment group and has high average expected income, and zero otherwise.

Broad x High range – dummy variable, that gets value of one if individual is in a broad treatment group and has a high range of expected income, and zero otherwise.

Positive x High average – dummy variable, that gets value of one if individual is in a positive mood treatment and has high average expected income, and zero otherwise.

Positive x High range – dummy variable, that gets value of one if individual is in a positive mood treatment and has a high range of expected income, and zero otherwise.

Positive x Broad x High average – dummy variable, that gets value of one if individual is in both positive mood and broad framing treatments and has high average expected income, and zero otherwise.

Positive x Broad x High range – dummy variable, that gets value of one if individual is in both positive mood and broad framing treatment and has a high range of expected income, and zero otherwise.

APPPENDIX E

Pairwise correlation coefficient of independent variables

	Positive	Broad	Positive x Broad	High average	High range	Probability	Rich	Broad x High average	Broad x High range	Positive x High average	Positive x High range	Positive x Broad x High average	Positive x Broad x High range	Positive Panas	Negative Panas
Positive	1														
Broad	0.020	1													
Positive x Broad	0.556	0.593	1												
High average	-0.169	0.193	-0.033	1											
High range	0.011	0.151	0.048	0.551	1										
Probability	0.229	0.051	0.146	0.037	-0.076	1									
Rich	0.032	0.221	0.131	0.00	-0.038	0.027	1								
Broad x High average	-0.131	0.685	0.234	0.618	0.391	0.113	0.170	1							
Broad x High range	-0.035	0.685	0.349	0.418	0.591	0.034	0.120	0.786	1						
Positive x High average	0.521	0.072	0.362	0.515	0.328	0.148	-0.040	0.276	0.217	1					
Positive x High range	0.133	-0.091	-0.036	0.117	0.118	-0.224	-0.094	-0.055	-0.052	0.239	1				
Positive x Broad x High average	0.357	0.381	0.642	0.352	0.265	0.145	0.067	0.556	0.479	0.685	-0.006	1			
Positive x Broad x High range	0.396	0.423	0.712	0.193	0.373	0.080	0.008	0.402	0.617	0.520	-0.011	0.798	1		
Positive Panas	0.374	0.022	0.193	-0.009	0.006	0.002	0.028	0.040	0.076	0.331	0.009	0.255	0.238	1	
Negative Panas	-0.352	0.037	-0.198	0.159	0.117	-0.111	-0.046	0.150	0.195	-0.101	0.024	-0.051	-0.059	0.028	1