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TITTEL:

Risikotaking på vegne av andre: Et laboratorieeksperiment

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Risk-taking on behalf of others: A laboratory experiment

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Preface

This Master Thesis is the obligatory and concluding part of the Master's degree in Economics and Business Administration at the University of Stavanger. Our specialization within the MSc programme is Economic Analysis, and the Master Thesis is equivalent to 30 credits per student.

We have chosen decision-making under uncertainty as our main subject, and especially how people behave when making risky decisions on behalf of others. The literature is scant on the area which makes it even more interesting to write a thesis on this subject.

Special thanks go to our thesis advisor, Professor Ola Kvaløy, for his inspiring words and constructive feedback. He has been very supportive and available during the entire process. In addition, we are indebted to doctoral candidate Kristoffer Eriksen for his useful comments. We would also like to thank all the busy students at the University of Stavanger who made time for participation in our experiment and provided us with necessary data. Funding from the Foundation for Applied Finance (SAFI) at the University of Stavanger is greatly appreciated.

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Abstract

Existing experimental literature on risk-taking have mainly focused on choices that only affects the decision-maker (see e.g. the survey in Harrison & Rutström, 2008). Surprisingly though, the literature is scant on the fundamental question of how people behave when taking risk on behalf of others. One explanation might be that rational models do not make any predictions on standard risk-taking on behalf of others (Eriksen & Kvaløy, 2009). To investigate this issue further, we defined the following problem:
Do subjects take more or less risk with other people's money than with their own money?

To better understand how people make decisions under uncertainty, we performed a survey of risk. Then we conducted a controlled laboratory experiment replicating Holt and Laury's (2002) multiple price list (MPL) design to ensure comparability with data from previous experiments. The replication served as a baseline and robustness test of Chakravarty et al.'s (2009) findings on a Norwegian sample. The MPL design provides a simple test for risk aversion in which each subject is presented with ten-paired lottery choice decisions between the safe lottery A and the risky lottery B. We have used number of safe choices and constant relative risk aversion (CRRA) to classify the subjects' risk attitudes. Contrary to the baseline experiment "Own", subjects in the main experiment "Others" made risky choices on behalf of anonymous persons.

The results from "Own" show that people in general are (slightly) risk-averse when making risky decisions over their own money, consistent with previous research (Harrison, Johnson, McInnes, & Rutström, 2005; Holt & Laury, 2002, 2005). We also found a significant treatment effect; subjects investing money on behalf of others take less risk than subjects investing their own money, reaffirming Chakravarty et al.'s (2009) findings. Assuming that the subjects distance their feelings towards outcomes, our findings support the *Risk-as-feelings* hypothesis (Hsee & Weber, 1997). In order to compare in-sample responses, Chakravarty et al. (2009) let their subjects either make decisions over their own money first, and then over another person's money, or vice versa. Thus our findings serve as a robustness check as different subjects performed the tasks in the baseline and main experiment.

Table of contents

Tables

Figures

Equations

1 Introduction

The area of research in this Master Thesis is experimental economics. Experimental economics is a relatively new area of research, but it has blossomed in recent years (Morgan, 2005). Nowadays economists perform hundreds of experiments every year and routinely test economic theories in the laboratory (Guala, 2005). Economics is an observational science and economic theories are devised to explain market activity (Davis & Holt, 1993). Still, traditional economic models lack the capacity to evaluate their predictions since they are founded on very subtle circumstantial and behavioural assumptions. In game theory, for example, these restrictive assumptions make the practical possibility of obtaining empirical evidence from naturally occurring markets small. As a consequence of this, a systematic evolution of economic theories under controlled laboratory conditions has developed. The use of experimental methods has become widespread in the last 20 years in order to bridge the gap between economic theories and observation. One of the pioneers in the field, Vernon L. Smith was awarded the Nobel Prize in Economic Sciences 2002 (jointly with Daniel Kahneman) "for having established laboratory experiment as a tool in empirical economic analysis, especially in the study of alternative market mechanisms" ("The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2002," 2010). Given the ever-growing complexity of economic models, researchers firmly believe that economics will increasingly become an experimental science (Davis & Holt, 1993; Plott, 1991).

We have chosen decision-making under uncertainty as our main subject in this study. After economists noted that laboratory methods could be useful in economics, individual decision-making experiments early become one of the distinct directions in experimental economics (Davis & Holt, 1993). These experiments were generally designed to examine if people behaved according to the axioms of the basic theory of choice under uncertainty (EUT), as formulated by von Neumann and Morgenstern (1944) and Savage (1954). In experiments of this type, subjects have to choose between uncertain prospects or lotteries, e.g. $2 if heads or $1 if tails (Davis & Holt, 1993). Thus the lottery is simply a probability distribution over prizes with a 50 % chance of winning either $2 or $1. Although EUT has faced critique (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), we rely on this theory to understand how people make decisions under uncertainty.

Existing experimental literature on risk-taking have focused on choices that only affects the decision-maker (see e.g. the survey in Harrison & Rutström, 2008), and research shows that subjects in general tend to be risk-averse when investing money their own money (Harrison, et al., 2005; Holt & Laury, 2002, 2005). Surprisingly though, the literature is scant on the fundamental question of how people behave when taking risk on behalf of others. To our knowledge, only Daruvala (2007), Chakravarty et al. (2009) and Eriksen and Kvaløy (2009) have addressed this issue. One explanation might be that rational models do not make any predictions on standard risk-taking on behalf of others (Eriksen & Kvaløy, 2009). To investigate this issue further, we have defined the following problem:
Do subjects take more or less risk with other people's money than with their own money?

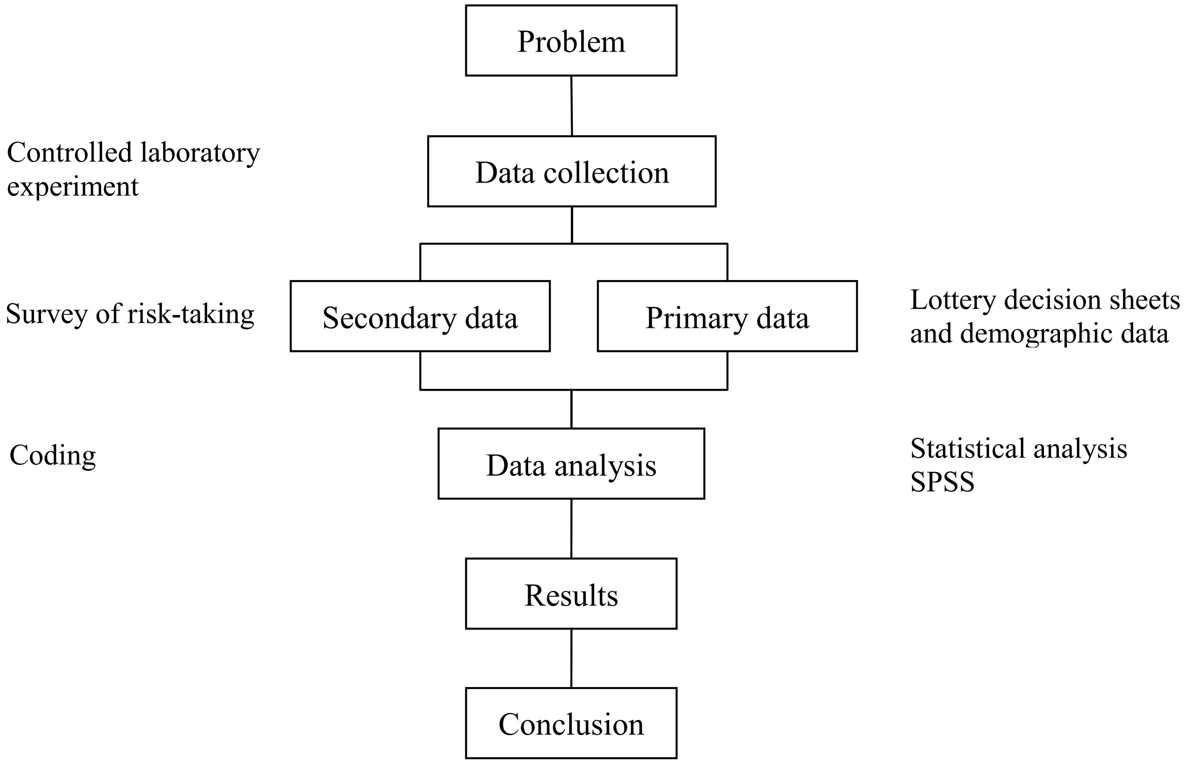
This problem is of great current interest because it can reveal important aspects of how risk attitudes change when people invest money on behalf of others instead of investing their own money. Mutual funds may use these aspects to improve the skills of their investment managers and acquire a competitive advantage. If mutual funds have a better understanding of how to analyze their clients' risk preferences more precisely, it should be easier to invest accordingly to each client's risk profile. Again, this may result in higher customer satisfaction and increased revenues. Below are two grim examples where investment managers misinterpreted or neglected the risk preferences of their clients.

Stock exchange markets are a large industry with several market participants. Mutual funds are sometimes accused of being irresponsible. One recent example that shed light on the dissatisfaction between clients and mutual funds is the conflict between eight Norwegian municipalities versus Terra Securities. The municipalities lost all of their investments and claimed a total of NOK 1.45 billions in satisfaction ("Terra-kommunene fikk 530 mill," 2008). Terra Securities went bankrupt and the municipalities only received a total of NOK 530 millions from the bankrupt estate. Their accumulated losses were about NOK 1 billion. Even though illegal investments were made by the municipalities, Terra Securities admitted that they did not inform the municipalities about the high risk involved in their investments (Lydersen & Lynum, 2007). This scandal is by far the biggest in recent Norwegian history, but on a daily basis investment banks face similar accusations. In an ongoing trial between client Petter Røeggen and investment bank DNB NOR, Røeggen claims that he thought his financial investments were risk-free (Sættem, 2010). Instead DNB NOR bought risky assets.

The examples above show that financial institutions will be the scapegoat in media if their investments do not match the risk profiles of their clients.

The purpose of this Master Thesis is to do a robustness check of Chakravarty et al.'s (2009) experiment. If their findings are reaffirmed, there is a tendency to exhibit less risk aversion when an individual makes a decision for an anonymous stranger. Since we exclude monetary incentives, this implies that there must be so-called other-regarding preferences (see Fehr & Schmidt, 2005 for a review) that make investment managers care about their clients' monetary outcome. Otherwise, investment managers would simply throw the die when making decisions for their clients.

Figure 1 – Structure of the Master Thesis



To obtain answer to our research problem chapter 2 presents a survey of risk-taking in order to understand how people make decisions under uncertainty. The survey describes expected utility theory (EUT), prospect theory (PT) and non-monetary motivation that affect risky decisions. Before the data collection, we provide a detailed description of different scientific methods in chapter 3. This chapter also give reasons for why we have chosen a controlled laboratory experiment as our research design. Chapter 4 focuses on models and techniques used to measure subjects' risk attitudes as well as detailed descriptions of how the experiment was designed and conducted. Then the data are analysed, results are presented and findings are discussed in chapter 5. Finally conclusions are drawn in chapter 6.

2 Survey of risk-taking

The following chapter presents different theoretical aspects that are important in order to understand individual's preferences when making risky decisions on behalf of others. The survey starts with a presentation of the two leading theories on how to evaluate prospects under uncertainty, Expected utility theory (EUT) and Prospect theory (PT). We have excluded monetary incentives in our experiment, and the section non-monetary motivation presents extrinsic and intrinsic motivation that might affect risky decisions.

2.1 Expected utility theory (EUT)

If the consumer has reasonable preferences about risk in different circumstances, then institutions will be able to use a utility function to describe these preferences. One of the most used methods of calculating a person's utility can be described as an EUT function, sometimes called a von Neumann-Morgenstern utility function, (see e.g. Varian, 2006). According to the EUT function, an individual chooses the highest expected utility, rather than the highest expected value. John von Neumann, a major figure in mathematics in the twenties, along with Oscar Morgenstern, an economist at Princeton, developed mathematical game theory and are considered to be pioneers in EUT. EUT can leniently be described as the utility of average level of consumption that you would get. The utility of any gamble may be expressed as a linear combination involving only the utility of the outcomes and their respective probabilities (von Neumann & Morgenstern, 1944). Utility functions are also normally continuous functions. An example of one particularly form that the utility function might take is the following:

$$U(c_1, c_2, p_1, p_2) = p_1 v(c_1) + p_2 v(c_2) \qquad (1)$$

The function tells us that the utility can be written as a weighted sum of some function of consumption in each state, $v(c_1)$ and $v(c_2)$, where the weights are given by the probabilities p_1 and p_2.

2.1.1 Axioms

Completeness, transitivity, reflexivity, monotonicity, convexity and *continuity* are six axioms of EUT that define a rational decision maker (von Neumann & Morgenstern, 1944).

The first axiom, *completeness*, assume that any two bundles can be compared, and that an individual has well defined preferences and can decide between them. For every bundle of c_1 and c_2 either $c_1 < c_2$, $c_1 > c_2$ or $c_1 = c_2$, in which case the consumer is indifferent between the two bundles. If c_1 is preferred to c_2, then a lottery that yields c_1 with probability p_1 and $p_2 = (1- p_1)$ is preferred to a lottery that yields c_2 with probability p_1 and $p_2 = (1- p_1)$. In our experiment the decision maker has 10 different decisions with two different payoffs, each with different probabilities. Hence it is easy for the decision maker to make a choice based on his preferences.

The second axiom *transitivity* assumes that if $c_1 > c_2 > c_3$, then $c_1 > c_3$. As an individual decides according to the completeness axiom, the individual also decides consistently. In other words, if the consumer thinks that c_1 is at least as good as c_2 and c_2 is at least as good as c_3, then surely he thinks that c_1 is at least as good as c_3. Transitivity is referred to as the axiom of substitution (Tversky & Kahneman, 1992). As mentioned above, the decision makers in our experiment have to choose which of the two risk profiles they prefer in all ten decisions. Participants may show inconsistent preferences. For instance, if some of the subjects start by choosing the risky choice, switch over to a series of safe choices and concludes with a series of risky choices, then the transitivity axiom is violated.

Reflexivity, the third axiom, is a trivial axiom and assumes that any bundle is at least as good as an identical bundle (von Neumann & Morgenstern, 1944). This axiom will not be violated in our experiment since there are not any identical bundles.

The fourth axiom is *monotonicity* and assumes that more is better. This is of course when it comes to goods and not evils. Consumer prefers more to less of all goods. The axiom should hold, but often only up to the point where the good shifts to be an evil or for all goods that are non-satiations goods. For example, consider a little child who can have as many ice creams he can eat. The first two may be fantastic, but the third may be less fantastic than the previous. The child can after the fifth feel sick and then the good has turned evil. Thus the shape of the indifference curve has a negative slope. In our experiment there might be some answers that violate the axiom of monotonicity, e.g. if the subjects choose lottery A over B in the last decision row. This implies that they prefer NOK 75, rather than NOK 145.

The fifth axiom *convexity* refers to the property of an individual's preferences towards various outcomes, and assumes that average is better than extremes. For instance, imagine two bundles of goods on the same indifferences curve. The weighted average bundle will be at least as good as or strictly preferred to each of the two extreme bundles. This axiom is not relevant in our experiment because we are looking at decisions under uncertainty with monetary outcomes and not consumer goods.

Continuity is the last of the six axioms and assumes that if bundle c_1 is strictly preferred to c_2, then bundles "close" to c_1 should also be preferred to c_2. In accordance with the convexity axiom, continuity is irrelevant in our case.

To be able to classify an individual as rational, all the mentioned axioms above should be satisfied and the preferences can be represented by a utility function. Hence if an individual always chooses his most preferred alternative, then he will choose one gamble over another if and only if the expected utility of one gamble exceeds the other and thereby maximizes his utility.

2.1.2 Risk aversion

From microeconomic theory one assume that a consumer has reasonable preferences about consumption in different circumstances, and we form a utility function to describe these preferences (see e.g. Varian, 2006). But when considering choice under uncertainty one must also add the element of uncertainty to the equation. How a person values one state as compared to another depends on the probability that the specific state will actually occur. Ultimately it is the beliefs of the individual about the likelihood of each state that determine his preferences.

In a lottery choice where one could win or lose money, the utility function will depend on both the probabilities and the possible gain or loss. If c_1 denotes state 1 (gain) and c_2 denotes state 2 (loss), then p_1 and p_2 are the probabilities that state 1 or 2 actually occurs. The probabilities are mutually exclusive so that $p_2 = (1- p_1)$. Given this notation, the utility function that represents the individual's preference in the lottery can be written as (von Neumann & Morgenstern, 1944):

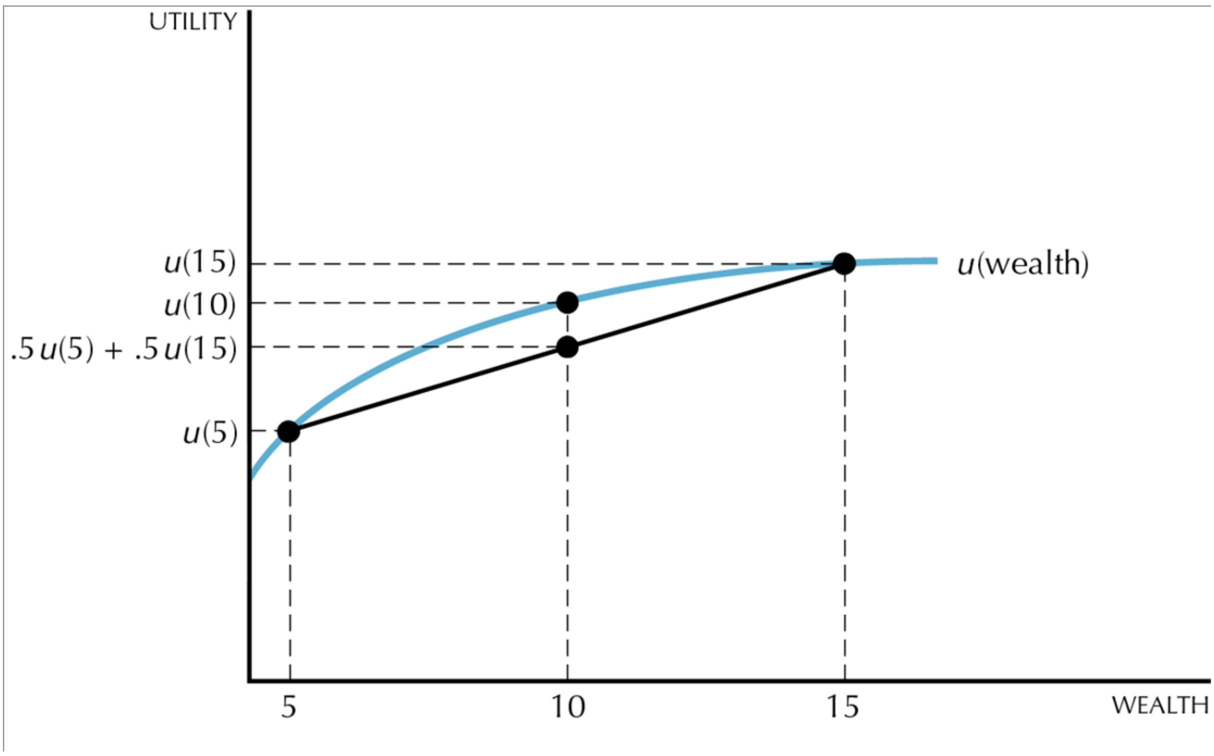
$$U(c_1, c_2, p_1, p_2) = p_1 c_1 + p_2 c_2 \qquad (2)$$

To apply this in an example, we will look at a simple lottery choice problem (Varian, 2006). Let us imagine that the consumer has an initial wealth of 10 NOK. He has a 50 % chance of losing or winning 5 NOK, respectively. Thus his wealth after participating in the lottery will either be 5 NOK or 15 NOK. If he does not take part in the lottery, the expected value of his wealth will be equal to his initial wealth of 10 NOK. The expected utility of participating in the lottery is:

$$EU = 0.5u(5) + 0.5u(15) \qquad (3)$$

A *risk-averse* person would in this case prefer to receive the expected value of his wealth with certainty rather than face the lottery (Grønn, 2005). In other words the utility of the expected value of wealth, $u(10)$, exceeds the expected utility of wealth, $0.5u(5) + 0.5u(15)$. The risk-averse consumer has a concave utility function (Varian, 2006, p. 225):

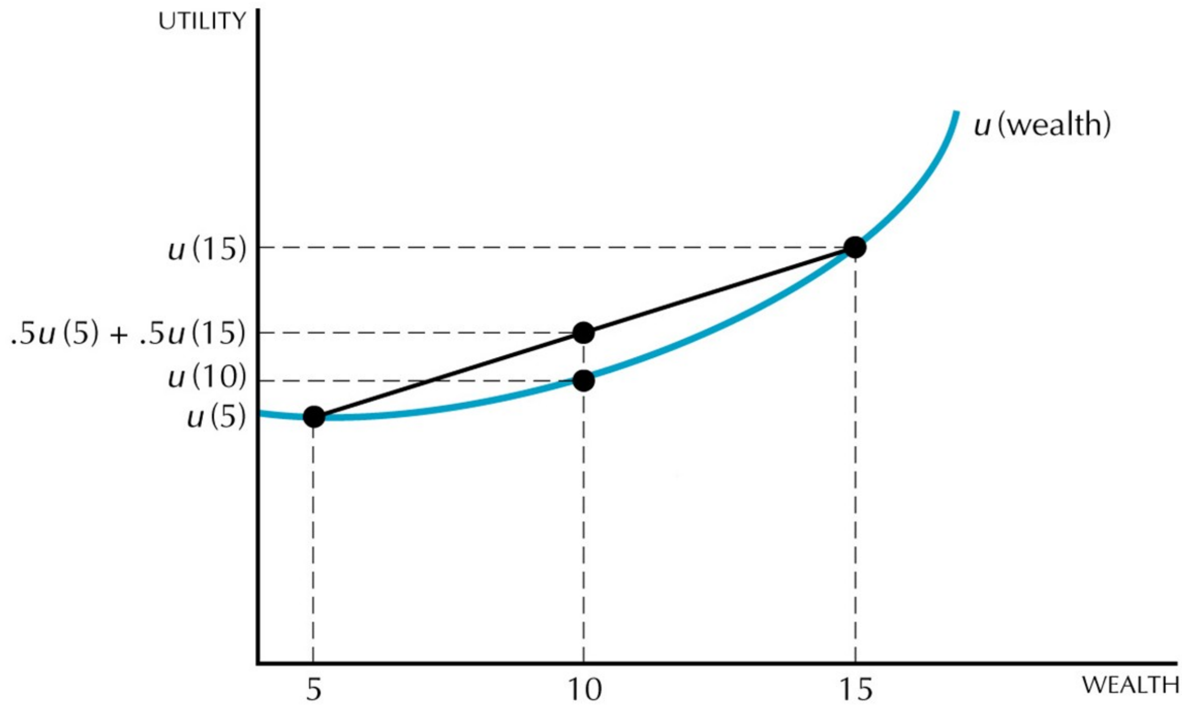
Figure 2 – Risk aversion



A person with *risk-neutral* preferences would exclusively rank the lottery after its expected value, i.e. he will pick the option with the highest expected value (Grønn, 2005). Since the initial wealth of 10 NOK equals the expected utility of wealth, he would be indifferent whether to take part in the lottery or not. Hence the risk-neutral consumer's utility function is linear.

A *risk lover* prefers to participate in the lottery no matter what, even if the expected value of wealth is greater than the expected utility of wealth (Grønn, 2005). Hence his expected utility of wealth, $0.5u(5) + 0.5u(15)$, exceeds the utility of the expected value of wealth, $u(10)$. A risk lover has a convex shaped utility function (Varian, 2006, p. 226):

Figure 3 – Risk loving



We expect different degrees of risk aversion among the subjects in our experiment. Although research shows great variety between subjects (see the survey in Harrison & Rutström, 2008), people in general tend to be (slightly) risk-averse when making decisions under uncertainty (Harrison, et al., 2005; Holt & Laury, 2002, 2005). However, our main research problem is to investigate whether people exhibit a higher or lower degree of risk aversion when making risky decisions on behalf of others.

2.2 Prospect theory (PT)

Kahneman and Tversky (1979) present a critique of EUT as a descriptive model of making decisions under risk and introduce an alternative theory called prospect theory (PT). PT presents another explanation to individual decision-making under risk and is developed for simple prospects with monetary outcomes and stated probabilities, even though it can be extended to more involved choices. There are three major ways that departs original PT from EUT (Harrison & Rutström, 2008):

1. In PT there is allowance for subjective probability weighting.
2. There is also allowance for the use of different utility functions for gains and losses and the use of a reference point defined over outcomes.
3. Contrary to EUT, PT has allowance for loss aversion. Loss aversion is the concept that the disutility of losses weighs more heavily than the utility of comparable gains.

In PT there are two phases that are important when making choices under risk, an early phase of *editing* (*framing*) and a subsequent phase of *evaluation* (*valuation*) (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). In the editing phase, the decision maker constructs a representation of acts, contingencies and outcomes that are relevant for the decision. The editing phase is a preliminary analysis of the offered prospect and consists of the following actions; *coding*, *combination*, *segregation* and *cancellation*. In the evaluation phase, the decision maker appraises the value of each prospect and chooses accordingly.

As opposed to EUT, *coding* refers to when individuals normally perceive outcomes as gains and losses, rather than final states. Every individual have their own neutral reference point that corresponds to the current asset position, in which case gains and losses coincide with actual amounts that are paid or received. Gains and losses are therefore defined relative to this reference point. The location of the reference point can be affected by the expectations and formulation of the individuals offered prospect.

Combination exists when prospects with the same outcome but with different probabilities can be combined into a simplified prospect. For example, two prospects of winning 200 with a probability of 25 % (200, 0.25; 200, 0.25) can by the decision maker be evaluated in a reduced form (200, 0.50).

The *segregation* action happens in the editing phase when decision makers segregate riskless from risky components. For instance, a prospect (300, 0.80; 100, 0.20) is naturally decomposed into sure gain of 100 and the risky prospect (200, 0.80).

Empirical evidence shows that many decision makers who participate in a sequential game tend to ignore the first stage if this stage is shared by both options, and base their decisions solely on the second stage. The evaluation phase is the second phase in PT where the edited prospects are evaluated, and of course the prospect of highest value is chosen.

Traditionally EUT has been generally accepted as a normative model of rational choice and widely applied as a descriptive model of economic behaviour, but according to Kahneman and Tversky (1979) people's preferences systematically violate the axioms of EUT. Contrary to EUT they find that people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty. This is called the certainty effect. The certainty effect violates the substitution axiom and can be exemplified by the following problem:

Option A:	50 % chance to win 1,000	Option B: Win 450 for sure
	50 % chance to win nothing	

The above problem was presented to an Israeli, a Swedish and an American sample. According to EUT one should expect subjects to choose option A due to a higher expected utility compared to option B (500>450), but the results show that the majority chose option B. The overweighting of certainty contributes to risk aversion in choices involving sure gains and to risk-seeking in choices involving sure losses. Here is an example of the latter case:

Option A:	80 % chance to lose 4000	Option B: Lose 3000 for sure

Although the expected loss is less for option B (-3000), 92 % of the subject still chose option A (-3200). This is consistent with PT in which values are determined by gains or losses rather than final states, and probabilities are replaced by decision weights (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992).

2.2.1 Ambiguity aversion

We learn that in order to evaluate different economic prospects, it is important to assume that every individual is homo economicus and that the marked is efficient etc. When facing a financial problem, standard financial theory assumes that investors behave rational (Berg, Dickhaut, & McCabe, 1995) and successfully identify and process important information in the course of reaching the optimal decision. This view is widely applied in different schools of economics and is considered a paradigm. Nevertheless, a body of empirical evidence collected in the recent years suggest that there are systematic departures from the predicted behaviour of investors (Charness & Gneezy, 2003; Henrich, et al., 2001). These findings challenge this paradigm.

Knight (1921) separates between uncertainty and risk, with risk being quantifiable in terms of explicit probabilities. For example, if a person attends a decision task where he is asked to guess which of three cups conceal a coin, the person can use mathematics to calculate the probability of getting the right answer the first time. In this case the probability of getting the right answer the first time is 33 %. In contrast you cannot calculate which colour is going to be the most popular car paint for the next years. When individuals show an attitude of preferring known risk to unknown risk, this attitude is called ambiguity aversion (Heath & Tversky, 1991).

When buying financial assets, it is rare to know the precise probabilities. Hence ambiguity aversion has attracted considerable interest, even though evidence is somewhat mixed concerning the effect it has on financial decision-making (Charness & Gneezy, 2003). Heath and Tversky (1991) test whether ambiguity aversion is included only in the games of chance, or whether it also extends to uncertainty about knowledge of world events. They find that people tend to make a bet based on chance when they do not feel that they possess enough information to prefer one outcome to another. Instead they rely on their vague intuition in situations where they feel particularly knowledgeable or confident. Their self-confidence can therefore trigger ambiguity aversion. In our experiment we use Holt and Laury's (2002) ten-paired lottery choice task known as Multiple Price List (see section 4.1), and the subjects can easily calculate the expected value of each different outcome. Because they can calculate the different probabilities, ambiguity aversion takes a more cautious position when making the different choices and we will easier identify more accurate CRRA differences between "Own" and "Others" treatment.

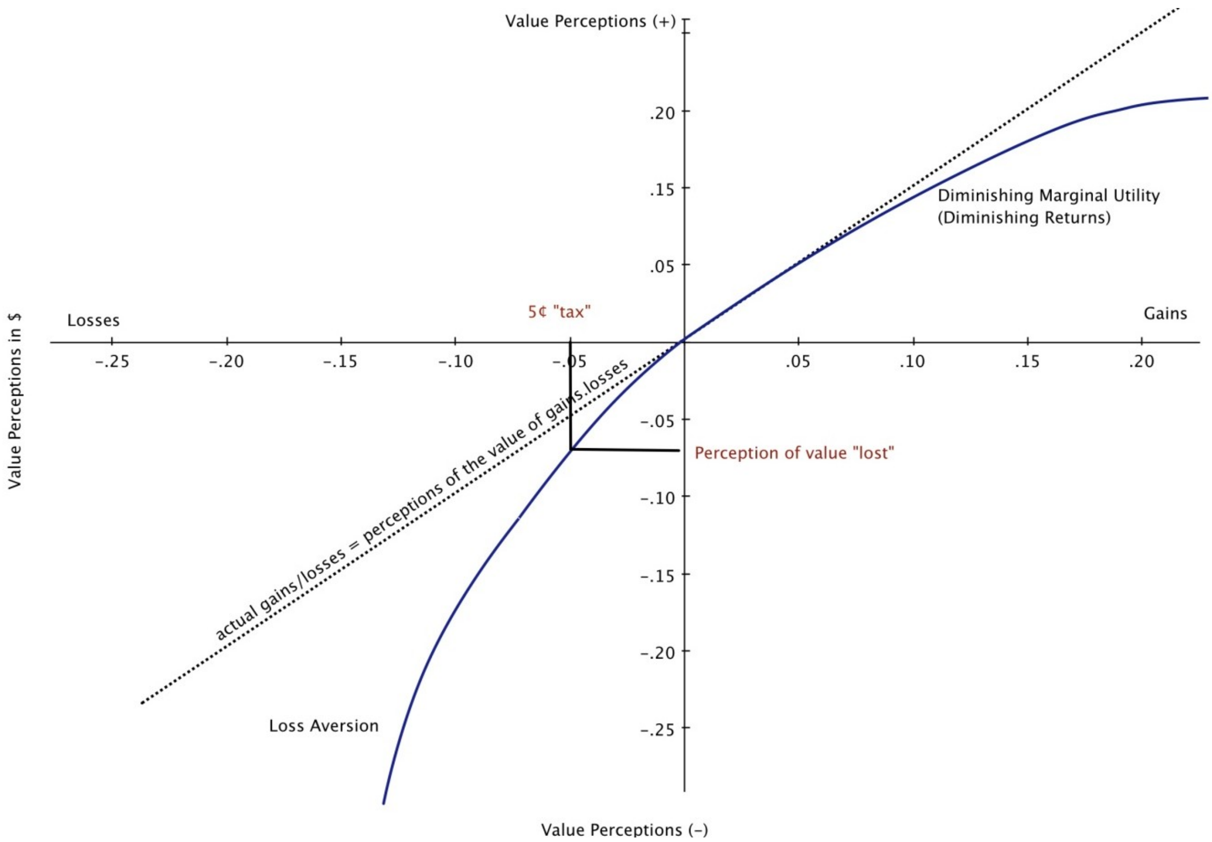
2.2.2 The illusion of control

Illusion of control is defined as when a person has a higher belief in his own probability of being successful than the objective probability would warrant (Langer, 1975). Is it possible that the participant will show an illusion of control when participating in our experiment? In our experiment the participants will throw the die themselves. According to Charness and Gneezy (2003, p. 7) this can trigger an illusion of control because: "(…) There is a sense that some people do have some preference for direct control – for example, many craps players care who rolls the dice at the table, and some strongly prefer to roll the dice themselves". Benassi, Rohner, Reynolds, and Sweeney (1981, p. 25) find that "The introduction of objectively irrelevant factors (e.g., active involvement) into a chance task will lead people nevertheless to perceive (and behave as if) they can exert control over the task".

2.2.3 The value function of Prospect theory

In PT the value function separate from the classical function of EUT in two ways (Tversky & Kahneman, 1992). The first difference is that the value function of PT is concave for gains, convex for losses, but steeper for losses than for gains. The other difference is that there exists a nonlinear transformation of the probability scale in PT. This transformation arises because small probabilities are overweighted and moderate and high probabilities are underweighted. A graph of this value function is presented below (Kambara, 2009):

Figure 4 – Prospect theory value function graph



2.2.4 Myopic loss aversion (MLA)

MLA is developed by Benartzi and Thaler (1995) and is based on two concepts from psychology of decision-making. Firstly investors are assumed to be loss-averse. Loss aversion refers to the tendency for individuals to be more sensitive to losses than gains and plays a central role in Kahneman and Tversky's (1979) descriptive theory of decision-making under uncertainty, PT. The second concept that MLA employ is mental accounting (Kahneman & Tversky, 1984; Thaler, 1985) that refers to the implicit methods individuals use to organize and evaluate investments and transactions. In particular, they assume that even long-term investors evaluate their portfolios frequently. Risk aversion tend to increase the more frequent investors evaluate their portfolio (Fellner & Sutter, 2009). Their motivation to develop MLA was triggered by the equity premium puzzle. Mehra and Prescott (1985) observed the average real annual yield on Standard and Poor Index to be 7 %, while the average yield on short-term debt was less than 1 %. The empirical fact that stocks have outperformed bonds over this period can be referred to as the equity premium puzzle (EPP). According to Benartzi and Thaler (1995), this enormous discrepancy between return on stocks and fixed income securities can be explained by MLA.

Mental accounting and loss aversion are well illustrated in the example of Samuelson (1963). In this example Samuelson offer a fifty-fifty bet at winning \$200 or losing \$100 to one of his colleagues. The colleague turns the bet down because he would feel the loss of \$100 more than the gain of \$200. At the same time he expresses willingness to take on hundred such bets as long as he does not have to watch them be played out. This exemplifies loss aversion, and also the kind of mental accounting it can imply. The utility function below captures this notion where x represents a change in wealth relative to status quo:

$$U(x) = \begin{matrix} x & x \geq 0 \\ 2.5x & x < 0, \end{matrix} \qquad (4)$$

As this example illustrates, compounding any number of this bet greater than one will be favourable for a loss-averse decision-maker as long as he does not have to monitor bets to be played out.

If we draw a parallel of the above example to a loss-averse investor choosing between stock and fixed income securities, the evaluation period will be crucial for the investor's attitude towards the risk of the investment (Ågren, 2005). On the one hand, the stock portfolio will seem unattractive to the investor if the portfolio is evaluated on a daily basis. This is because stock returns go up almost as often as they go down, and the hurt from losses will overweigh the joy of winning. On the other hand, consider a longer evaluation period of say one year. Then the same portfolio will appear more attractive for the investor. Hence the risky asset will seem more attractive to the investor the longer period he tends to hold it, as long as the investment is not evaluated frequently. Relatively risk-free assets do not display losses as often as more risky assets and are therefore not affected by MLA in the same extent.

In our experiment we will not focus on how frequent portfolios are evaluated although MLA can partly explain how people make decisions under uncertainty (Benartzi & Thaler, 1995; Gneezy & Potters, 1997). Instead we rely on EUT and Holt and Laury's (2002) design to investigate individuals' risk attitudes.

2.3 Non-monetary motivation

This chapter focus on the non-monetary motivation that affects risky decisions. EUT is our main focus when we characterize the subjects' risk preferences, but it is also important to recognize non-monetary motivation as a possible explanation. For example, a subject might not respond in accordance with EUT, but his behaviour might be rational he if he is motivated by non-monetary incentives. For instance, a spiteful character could deliberately choose lotteries with the lowest expected values when making risky decisions on behalf of others, contradictory of EUT.

Usually most of the over-the-counter traders have an incentive contract when administering their clients' money (Brealey, Myers, & Allen, 2008). For instance, a trader can claim 5 % of the clients' monetary outcome. This type of incentive is according to Eriksen and Kvaløy (2009) the most obvious extrinsic motivation. Motivation can also be extrinsic if the investment manager feels ashamed about losing his client's money or if he does not feel he has fulfilled the monetary expectations of his client. In this matter, the disutility from losing money is not directly linked to the clients' payoff, but rather to the client's observation of the investment managers' performance. In our experiment we exclude such monetary incentives and hypothesize that there exist intrinsic motivation among investment managers. In contrary to extrinsic, intrinsic motivation torments the manager's conscience when not performing well and the manager may feel empathy for his clients even if the client cannot observe his performance. Extrinsic and intrinsic motivation contains of other-regarding preferences.

2.3.1 Other-regarding preferences

Following von Neumann and Morgenstern's (1944) EUT, most economics assume that self-interest is the sole motivation for all rational people (Grønn, 2005). But various pioneering economists have pointed out that people tend to care for the well-being of others (Arrow, 1981; G. S. Becker, 1974; Samuelson, 1993; Sen, 1995; Smith, 1759) and that this may lead to important economical consequences (Fehr & Schmidt, 2005). Experimental economists and psychologists have gathered substantial evidence over the last two decades which indicates that people are strongly motivated by other-regarding preferences and do care for the well-being of others.[1] With these evidences in mind, the real question is therefore not whether there

[1] See Fehr & Scmidt (2005) for a review.

exist other regarding preferences, but how these preferences impact agents when making decisions on behalf of their clients.

From the standard self-interest model, the literature on other-regarding preferences has focused on three different departures (Fehr & Schmidt, 2005). In addition to maximizing material resources a person may also care about:

1. The material resources allocated to other persons in a relevant reference group (altruism)
2. Different persons' fairness of behaviour in a relevant reference group (inequity aversion)
3. The character of the reference agents, i.e. whether the agents have selfish, altruistic, fair-minded or spiteful preferences

2.3.1.1 Altruism

The utility function of an individual suffering from altruism depends on the material resources allocated to other agents in a relevant reference group. Altruism is the opposite of selfishness and is a form of unconditional kindness (Christoffersen, Johansen, Ariansen, Wetlesen, & Saugstad, 1994). In mathematical terms, this means that the first derivate of the utility function of an individual with respect to the material resources received by any other agent is always strictly positive (Fehr & Schmidt, 2005). The German philosopher Friedrich Nietzsche is critical to this unselfish moral, and states that the social community will suppress the altruistic person (Christoffersen, et al., 1994). Nietzsche means that there is no such thing as pure altruism, because if a person is pure altruistic he could not encourage others to be altruistic, but rather spiteful. In other words he alleges that a person is kind because it would make him feel better.

2.3.1.2 Inequity aversion

Inequity aversion is perhaps a more realistic attitude observed when individuals make economical allocations that affect others than just themselves. If an individual in addition to his material self-interest increases his utility by allocating material payoffs more equitably, then he can be characterized as inequity averse (Fehr & Schmidt, 2005). As long as the allocation of additional material resources becomes more equitable, the inequity-averse person will value this as positive. Definitions of equity are very important in economic models, and are usually defined as equality of monetary payoffs in experimental games. Deviation of equity can be measured in terms of income differences between individuals in the same reference group or the individual's relative share of the overall surplus.

In the case of different person's fairness of behaviour in a relevant reference group, many people deviate from purely self-interested behaviour in a reciprocal manner. On the one hand, reciprocity means that in response to friendly actions, people are frequently much nicer and more cooperative than predicted by the self-interest model (Fehr & Simon, 2000). On the other hand, in response to hostile actions, an individual becomes frequently much nastier and even brutal. By using conventional game theory it is impossible to incorporate reciprocity in an economic model. Since preferences depends on intentions, and not only material payoffs, it requires the tools of psychological game theory (Geanakoplos, Pearce, & Stacchetti, 1989).

2.3.1.3 The character of the reference agents

The third departure of other regarding-preferences is the character of reference agents, i.e. whether agents have selfish, altruistic, fair-minded or spiteful preferences. According to Levine (1998), a player's weight on the opponent's monetary payoff depends both on their own coefficient of altruism (or spite), and what their opponent's coefficients are. For instance a person will behave kindly towards an altruistic opponent, but will seek revenge if the opponent behaves spiteful. It is important to separate between the *intentions* of the opponent's actions and not his character (Fehr & Schmidt, 2005). Fehr and Schmidt (2005) claim that when separating type and intention, type-based reciprocity can be modelled using conventional game theory.

2.3.2 Risk-taking on behalf of others

Financial institutions often make decisions with uncertain outcome on behalf of their customers, the investors. Institutions offer a variety of risk portfolios with different outcomes and profits. Although the investors can choose between several investment packages with different risk profiles, it is important that the decisions made by the agent reflect the risk preference of the client. Given no paternalism,[2] the optimal decision would be the one reflecting the investor's risk preferences (Daruvala, 2007). This requires an unbiased

[2] "Paternalism" can be defined as "The policy or practice of restricting the freedoms and responsibilities of subordinates or dependants in what is considered or claimed to be their best interests" ("Paternalism," 2004).

perception of the risk preference of those affected, and that the decision made should perfectly reflect that perception.

There have been several experiments conducted on the measurement of risk preferences (Carlsson, Daruvala, & Johansson-Stenman, 2005; Gneezy & Potters, 1997; Harrison, et al., 2005; Holt & Laury, 2002, 2005) but relatively little on how people make decisions on behalf of others. As far as we know, the only studies that have investigated the latter issue is Daruvala (2007), Chakravarty et al. (2009) and Eriksen and Kvaløy (2009). In contrast to Chakravarty et al.(2009), Eriksen and Kvaløy (2009) find that people are less risk-averse when investing money on behalf of others than when investing their own money. This result supports Brown's (1965) *Risk-as-value* hypothesis which states that people perceive themselves as more risk-seeking than their peers based on the related assumption that they are better than others and that risk-seeking is an admirable characteristic (Shapira, 1995). Thus they are more likely to have a higher propensity for risk than others.

Contrary to Eriksen and Kvaløy (2009), Chakravarty et al.'s (2009) results is consistent with the *Risk-as-feelings* hypothesis which states that individuals will predict that other people are less risk-averse than themselves and lean to risk neutrality (Hsee & Weber, 1997). This hypothesis also suggests that feelings play a much more decisive role in risky decisions than the traditional EUT. When faced with a risky choice, people have strong feelings and they have difficulty in conceiving that others have the same depth of feelings and therefore the prediction for the target leaning to risk neutrality (Daruvala, 2007).

Bechara, Damasio, Tranel, and Damasio (1997) conducted a study of risk-taking with normal, healthy subjects and subjects with prefrontal damage[3] and decisions defects. Their game of gambling consisted of four decks of cards; two high payment decks ($ 100) and two low payment decks ($ 50). On any given turn, individuals could draw from any of the four decks and receive either monetary gains or losses. The high paying decks had a net negative expected value due to occasional penalty cards with severe losses. Bechara et al. (1997) found that both groups began sampling from all four decks, but avoided the high paying decks immediately after drawing penalty cards. Despite a strong desire to win and a thorough

[3] "Prefrontal" is defined as "The gray matter of the anterior part of the frontal lobe that is highly developed in humans and plays a role in the regulation of complex cognitive, emotional, and behavioral functioning" ("Prefrontal cortex," 2010).

understanding of the game, the patients returned to the high paying cards more quickly after suffering a loss than the non-patients. The result of this tendency was that the patients often went "bankrupt". A possible reason why the patients returned to high payment decks quicker than the non-patients can according to Hsee and Weber (1997) be their inability to experience fear when drawing a penalty card. If the agents in Chakravarty et al (2009) made cynical decisions on behalf of their clients but let their feelings affect decisions made when administering their own money, they acted in compliance with the *Risk-as-feelings* hypothesis.

2.3.3 Risk-taking on behalf of a group

The experiments of Chakravarty et al. (2009) and Eriksen and Kvaløy (2009) are both focusing on the principal-agent problem[4]. Charness and Jackson (2009) explored a play where one member of each two-person group acted as an agent for this group. He was in charge of dictating the play for that group and was therefore responsible for the payoff of the other group member. Sequentially, they conducted a play where each subject was independent and payoffs were solely based on their own decisions. This game is a variant of Rousseau's classical Stag Hunt game (see e.g. Skyrms, 2004). Charness and Jackson (2009) found that the behaviour of about 30 % of the population was sensitive to the issue of being responsible for another person's welfare. In almost 90 % of these cases, the decider played a less risky strategy than when his actions only affected him. Their results are consistent with Reynolds, Joseph, and Sherwood (2009) who found that people are less risk-averse when making decisions that only affect themselves than when making decisions that affect others. A consequence of the lessened risk is slightly lower average payoffs that also affect the others in the group. The lower payoff is a social cost for the decider since his decisions harvest displeasure in the group. A sense of responsibility for the welfare of others has an effect on risk taking, is consistent with the principle of *responsibility-alleviation*[5] described in Charness (2000).

[4] A "principal-agent" problem refers to a situation where a principal uses the service of a well-informed agent (see e.g. Grønn, 2005). Usually there is worked out a contract between the two parties. Since we have excluded monetary incentives, which often are represented in such contracts, we will not delve deeply in agent-principal theory.
[5] A shift of responsibility to an external authority dampens internal impulses towards honesty, loyalty, or generosity. This effect is referred to as the *responsibility-alleviation* effect (Charness, 2000).

2.3.4 Gender differences in risk-taking

A question that is often asked is whether there exist gender differences in risk-taking. One of the most common stereotype is that women are more risk averse than men (Charness & Gneezy, 2007)[6]. In the experiment of Daruvala (2007) this stereotype is verified in the predictions made by both sexes. But when the same subjects made actual choices on behalf of others, the results were contrary to the predictions. Nevertheless, there are several empirical evidences of gender differences where females tend to take less risk (see e.g. the survey in Charness & Gneezy, 2007; Croson & Gneezy, 2009; Eckel & Grossman, 2008). Charness and Gneezy (2007) direct criticism towards the empirical investigation of gender differences in risk-taking because there is a vast variation in the methods used to study this phenomenon. A lot of the experimental work, mostly done by psychologists, each uses different decision problems which makes it hard to compare the results. Charness and Gneezy (2007) find that some papers were specifically designed to test for gender differences and that others found gender differences without looking for them.

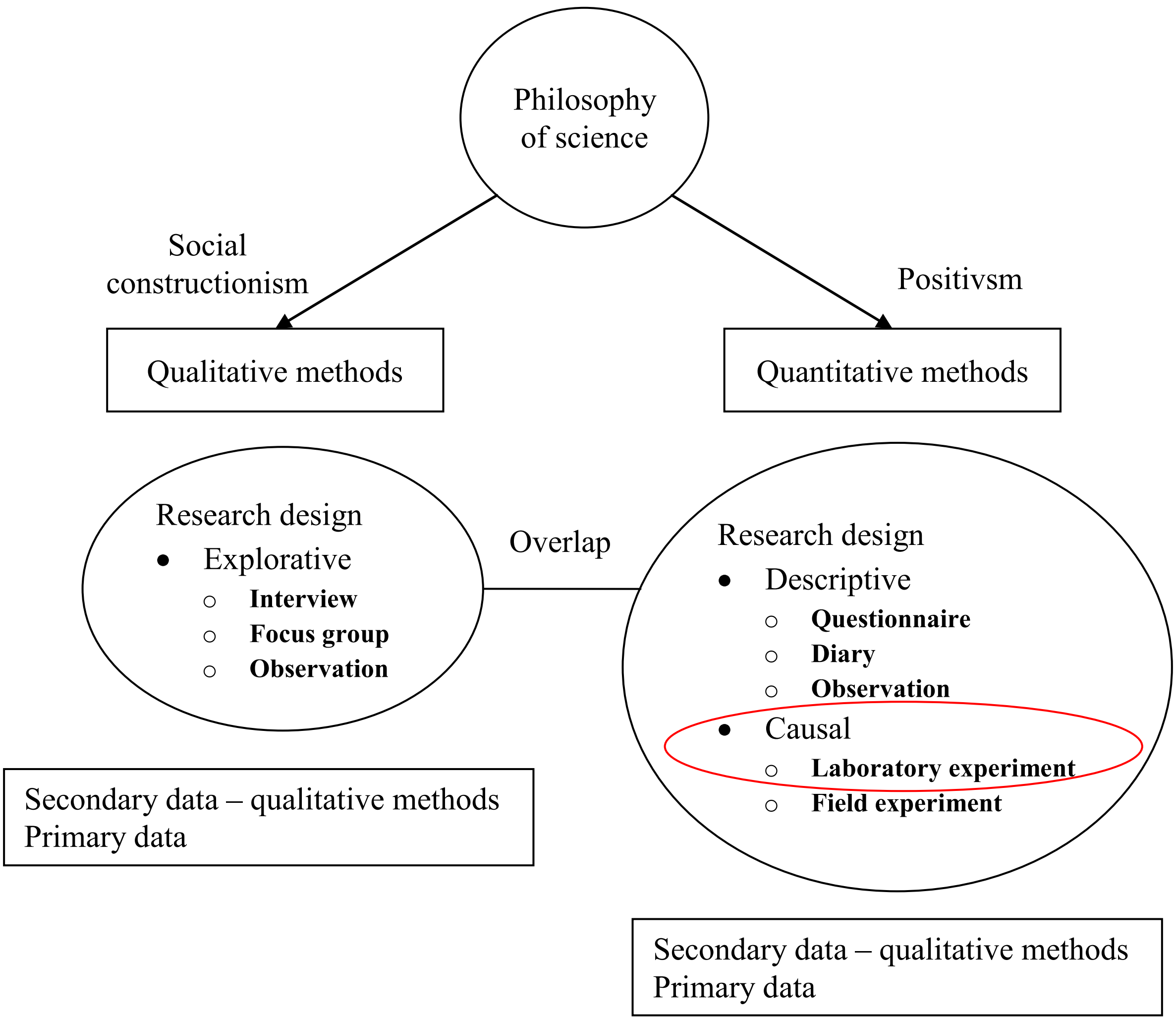
Although the articles mentioned above find evidences for gender differences, they present vague explanations to why this phenomenon occurs. This is probably why the simple majority has a perception of the existing stereotype in gender differences.

3 Scientific method

In this chapter we will explain our theoretical approach to scientific method including philosophy of science, qualitative and quantitative methods, research design and secondary and primary data. We provide a detailed description and continuously give reasons for why we have chosen a causal research design, or more precisely a *controlled laboratory experiment*, to obtain answers to our research questions. Figure 5 presents a model of different scientific methods and research designs.

[6] Even though it is not completely clear how the hunter-gatherer origins map into contemporary financial behavior (Charness & Gneezy, 2007), some might argue that the gender difference seems grounded in evolutionary psychology, given our role-differentiated hunter-gatherer roots (for evolutionary psychology literature, see e.g. Cosmides, Tooby, & Barkow, 1992; Tooby & Cosmides, 1990, 1992).

Figure 5 – Model of scientific methods and research designs



3.1 Philosophy of science

In scientific research we mainly distinguish between two different methods; *qualitative* and *quantitative* (Grønmo, 2004). *Qualitative* methods origin from the philosophical tradition called *social constructionism* which briefly entails that people's subjective experiences are recognized as valid knowledge (Easterby-Smith, Thorpe, & Lowe, 2002). Social constructionists claim that the phenomenons we are investigating are determined by people's way of perceiving "reality", rather than objective and external factors. *Quantitative* methods descend from the philosophical tradition called *positivism*. The key idea of positivism is to find causal connections that can be used to predict general behaviour patterns. Contrary to social constructionists, positivists stress that the world exists externally, and that its properties should be measured through objective methods.

3.2 Quantitative method

So which method has been used in this master thesis – qualitative or quantitative? According to Gripsrud, Olsson and Silkoset (2004) it is the data collected that can be characterized as either qualitative or quantitative. We gathered data from decision sheets and questionnaires to measure risk aversion and control for demographic effects. Evidently, we have chosen a *quantitative approach* to obtain answers to our research questions. Data collection are described in details in chapter 4.

3.3 Research design

A research design expresses the structure of the research problem and the plan of investigation used to obtain empirical evidence with relation to the problem (Phillips, 1976). It specifies the methods and procedures for data collection, measurement and data analysis (Kerlinger & Lee, 2000). Furthermore it is common to distinguish between three main categories of research design (Cooper & Schindler, 2001): *explorative*, *descriptive* and *causal*.

Explorative design is used within qualitative research and is consequently not relevant in our thesis. Data collection techniques for *descriptive design* are questionnaires, observations or diaries. Hence it is not a suitable design in our study. Even though we make use of a questionnaire, the purpose of the questionnaire is however to control for demographic effects. To be able to examine possible causal connections we are depending on a causal design, which really just means that we use some kind of experiment (Gripsrud, et al., 2004). Since we are trying to find possible causal connections for people's risk attitudes, it is obvious that we have adopted a *causal design.*

3.3.1 Causal design

In a causal design the, the purpose is to show that one incident (X) is the cause of another incident (Y) given the boundary conditions (Z). To achieve this, we have to establish that (Cooper & Schindler, 2001):

- There is correlation between X and Y
- X happens before Y
- Other possible causes for correlation are not present (isolation)

Transferred to our study, we want to show that treatment (X), i.e. investing money on behalf of others, result in either less or more risk-taking (Y) given certain boundary conditions (Z) which will be addressed in section 4.2.

The main point in an experiment is to manipulate the explanatory variables in order to see if they have any effect on the dependent variable (Gripsrud, et al., 2004). Thus our aim is to manipulate the explanatory variable *treatment* in order to see if that have any effect on the dependent variable *risk aversion.* When researchers intervene in a situation and investigate the effect of what they have done, it is per definition always an experiment (Gripsrud, et al., 2004). The setting can either be in a *laboratory* or in the *field* (Harrison & List, 2004). We have chosen a *laboratory setting* because we wanted to isolate the effect of stimuli by eliminating noise from the surroundings.

3.3.1.1 Controlled laboratory experiment

To summarize we have applied a *quantitative design* in order to obtain answers to our research problem, i.e. whether people take more or less risk with other people's money than with their own. Our aim is to find causal connections between the dependent variable *risk aversion* and the explanatory variable *treatment*. Thus we have chosen a *causal design*, or more exactly a *controlled laboratory experiment*. In addition, we control for demographic effects like sex, education, income etc. that might affect the treatment effect. Pioneers like the 2002 Nobel Prize winner Vernon L. Smith have established controlled laboratory experiments as a recognized scientific method to find answers to economic problems ("The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2002," 2010). Hence controlled laboratory experiments are widely used in economic research[7], and they can be described by the following criteria (Gripsrud, et al., 2004):

a) Randomized distribution of subjects in an experiment and a control group (randomization)
b) Manipulation of the experiment group (stimuli)
c) Takes place in an artificially created setting (laboratory)
d) Makes it possible to isolate the effect of stimuli because the surroundings can be controlled
e) Can get results that are not valid in natural surroundings

[7] See e.g. Fehr & Schmidt (2005) and Harrison & Rutström (2008) for a review

In accordance with the criteria above we carried out the experiment as follows:

a) Our participants were stochastically[8] distributed in two groups; one experiment group and one control group. This secured a random distribution of stimuli.
b) We manipulated the experiment group by offering stimuli to the subjects in this group. Consequently, subjects in the control group did not receive any treatment. As mentioned above, subjects in the control group invested their own money while subjects in the experiment group invested others money.
c) The experiment took place in a classroom because we wanted to create a copy of the real world in an artificial laboratory setting.
d) The laboratory setting made it possible to isolate the treatment effect due to fully control of the surroundings.
e) However, a laboratory setting might yield results that are not valid in natural surroundings (Gripsrud, et al., 2004). One should always question whether the surroundings in an artificially created setting can be transferred to the real world as people might behave differently in a laboratory, rather than in a natural setting[9]. Nevertheless, laboratory experiments are useful because you can isolate other effects.

3.4 Secondary and primary data

The data that the researcher collects to obtain answers to his problem are usually differentiated between *primary and secondary data* (Grønmo, 2004). Secondary data are collected to serve another purpose. The secondary data we make use of in our study are existing theories and research on the field, specified in the references. Our two most important sources are Holt and Laury (2002, 2005) and Chakravarty et al. (2009) as we have done a replication of their experiments. Primary data are gathered by the researcher himself, i.e. our primary data consist of data from decision sheets and questionnaires in order to measure risk aversion and control for demographic effects.

[8] "Stochastic" means " Randomly determined; that follows some random probability distribution or pattern, so that its behaviour may be analysed statistically but not predicted precisely" ("Stochastic," 2004).
[9] One of the most well-known laboratory experiments in a business context is the Hawthorne experiment where the Hawthorne effect was established. In this experiment a group of women were placed in a laboratory to execute the manual work they usually did in their daily jobs. The goal of the experiment was to show how changes in the number of breaks and the length of these, adjustments of heating and lighting and so on did affect productivity. As the study proceeded, the results showed that productivity increased independently of the implemented changes. For instance, productivity increased even though lighting was dimmed. The conclusion was that the worker's productivity did not depend on the working conditions and the surroundings but the experiment itself. The attention the workers got from the scientists created this effect.

Now that we have established and explained why we have used a controlled laboratory experiment as our research design in this master thesis, we turn to the data collection process.

4 Data collection

This chapter focuses on the models and techniques we have used to measure subjects' risk attitudes as well as detailed descriptions of how the experiment was designed and conducted. We also present hypotheses based on existing literature and our own assumptions.

4.1 Risk elicitation procedures

According to Harrison and Rutström (2008), five general elicitation procedures have been used to measure risk attitudes from individuals in the laboratory using non-interactive settings:

1. Multiple Price List (see below)
2. Random Lottery Pairs (Hey & Orme, 1994)
3. Ordered Lottery Selection (Binswanger, 1980, 1981)
4. Becker-Degroot-Marshak (G. M. Becker, Degroot, & Marschak, 1964)
5. Trade-Off (Wakker & Deneffe, 1996)

4.1.1 Multiple Price List (MPL)

The first to use an MPL design in the context of ascertain individual risk attitudes, is most likely Miller, Meyer and Lanzetta (1969). Their subjects faced five alternatives that constitute an MPL, even though the alternatives were presented individually over 100 trials. Later the method has been used by Schubert, Brown, Gysler, and Brachinger (1999), Barr and Packard (2002), Holt and Laury (2002) and Chakravarty et al.(2009). Even though the MPL design has faced some criticism because it assumes that EUT holds[10], Harrison and Rutström (2008, p. 105) maintain that "(…) One cannot expect any theory to predict perfectly, since any violation would lead one to reject the theory no matter how many correct predictions it makes". Holt and Laury's (2002) MPL design provides a simple test for risk aversion in which each subject is presented with ten-paired lottery choice decisions between lottery A and B.

[10] Several recent studies, e.g. Gneezy & Potters (1997) and Haigh and List (2005), test EUT directly against the alternative MLA hypothesis. Still, their findings can be explained without relying on MLA (Harrison & Rutström, 2008). Decreasing relative risk aversion does not reject the EUT in this case.

4.2 Experimental design

We have selected Holt and Laury's (2002) design since it is the most well-known and commonly used baseline experiment within the MPL framing. As far as we know, our study is the first besides Chakravarty et al. (2009) to test whether people are risk-averse over other people's money using this specific design[11]. We first replicated the experiment of Holt and Laury (2002) to ensure comparability with data from previous experiments. The replication served as a baseline and robustness test of Chakravarty et al.'s (2009) findings on a Norwegian sample.

4.2.1 Baseline experiment

Our baseline experiment, referred to as "Own"[12], followed Holt and Laury's (2002) design mentioned above. The subjects in "Own" formed the control group and consequently did not receive any treatment. The basic payoff matrix presented to subjects is illustrated in table 1:

Table 1 – Ten-paired lottery choice payoff matrix

	Lottery A				Lottery B						
Decision	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	EV(A)	EV(B)	Payoff difference
1	0.1	75	0.9	60	0.1	145	0.9	4	61.50	18.10	43.40
2	0.2	75	0.8	60	0.2	145	0.8	4	63.00	32.20	30.80
3	0.3	75	0.7	60	0.3	145	0.7	4	64.50	46.30	18.20
4	0.4	75	0.6	60	0.4	145	0.6	4	66.00	60.40	5.60
5	0.5	75	0.5	60	0.5	145	0.5	4	67.50	74.50	-7.00
6	0.6	75	0.4	60	0.6	145	0.4	4	69.00	88.60	-19.60
7	0.7	75	0.3	60	0.7	145	0.3	4	70.50	102.70	-32.20
8	0.8	75	0.2	60	0.8	145	0.2	4	72.00	116.80	-44.80
9	0.9	75	0.1	60	0.9	145	0.1	4	73.50	130.90	-57.40
10	1.0	75	0	60	1.0	145	0	4	75.00	145.00	-70.00

All amounts in table 1 are in Norwegian crowns (NOK). Lottery A is considered to be the safe choice, while lottery B is considered to be the risky choice. Decision row 1 implies that lottery A offered a 10 % probability of winning NOK 75 and a 90 % probability of winning NOK 60. As shown in the third-last column, the expected value for lottery A, EV(A), is NOK

[11] A recent paper by Eriksen & Kvaløy (2009) investigated the same basic question of how people behave when taking risk on behalf of others . However, they tested if people behaved consistently with MLA on behalf of other people's money using Gneezy & Potter's (1997) design as baseline experiment.
[12] Chakravarty et al. (2009) denote their baseline experiment "Self".

61.50. The expected values and the payoff differences were not given to the subjects. Similarly, lottery B offered chances of receiving NOK 145 or NOK 4 in the first decision row with an expected value of NOK 18.10. The last column shows that the expected payoff difference is NOK 43.40 for decision 1, i.e. a risk-neutral person would prefer lottery A to B due to higher expected payoff. The other decisions are similar, except that as one moves down the table, the chances of the higher payoff for each option increase. Accordingly, the expected value of both lotteries increases, but after row 4 the expected value of lottery B exceeds the expected value of lottery A.

The subjects chose either A or B in each row. After the subjects had made a decision for each row, they threw a ten-sided die twice. The first throw determined which row to be used, and the second throw determined the payoff for that row. The logic behind this test for risk aversion is that only risk lovers would choose lottery B in the first row, and only risk-averse subjects would choose lottery A in the second last row. Row 10 is basically just to check that the subject understood the instructions, and is not relevant in terms of risk aversion. It is expected that the majority of the subjects would switch from A to B at some point in the matrix, and this switching point can be used to reveal their risk attitude. A risk-neutral subject would pick lottery A in the first four rows and then switch to lottery B for the remaining rows as he solely base decisions on highest expected value. Although subjects made ten decisions, only one random row were selected to be played out to determine payoff. This is a popular and widely used procedure (Chakravarty, et al., 2009; Harrison, et al., 2005; Holt & Laury, 2002, 2005), but not essential.

We have multiplied Holt and Laury's (2002) baseline prizes by 37.5 times to "change" USD into NOK. This implies prize values of NOK 75 and NOK 60 in the safe lottery A, and values of NOK 145 and NOK 4 in the risky lottery B[13]. Using the official exchange rate, 1 USD = 5.89 NOKs at the time of the experiment which yields payoffs of $12.74 and $10.19 in lottery A, and payoffs of $24.64 and $0.68 in lottery B[14]. Another way to calculate payoffs is to use data that better reflects the purchasing power of the Norwegian Crown in Norway, in terms of goods and services. Using purchasing power data from the *Penn World Tables* (Heston, Summers, & Aten, 2009), lottery prizes roughly transfers to $8, $6.4, $15.4 and $0.4,

[13] Holt & Laury's (2002) prize values were $2, $1.60, $3.85 and $0.1, respectively.
[14] Daily average interbank rate were USD/NOK = 5.8855 ("Historical Exchange Rates: FXHistory®: Quality rates from 1990," 2009), e.g. NOK 75 * 5.8855 = $12.74.

respectively, which equal a scaling of 4 times the baseline prizes of Holt and Laury (2002)[15]. Taken into account that the subjects' average earnings in the baseline experiment were NOK 296.20 for 45 minutes work, we claim that the payments were considerable. Norwegian students have a relatively low earning power, receiving about NOK 90 000 a year from the State Educational Loan Fund in Norway which converts to about NOK 52 per hour[16]. Still, conversion to US dollars at official exchange rates or purchasing power data does not affect inferences about risk attitudes from observed choices.

The baseline experiment was held in two sessions, denoted session A and C, in which the participants completed two tasks. Task instructions were handed out sequentially so that the subjects did not have any information about the nature of the subsequent tasks when performing the first task. In the first task, the subjects made ten decisions between lottery A or B, and indicated their choices in a decision sheet (see description above). All stochastic draws were done by using a ten-sided die. This task aimed at measuring the risk attitudes of the subjects. The second task consisted of filling in a questionnaire regarding demographic data. Afterwards they were informed about the additional money that they could earn from decisions made by a person in the other room, picked at random. At the end of the experiment, the subjects received their earnings and signed a receipt before they were asked to leave the room. The average earnings of NOK 296.20 can be divided in three; a NOK 100 participation fee, payoff from decision task 1 and payoff from a stochastically chosen person in the other room. We have enclosed complete instructions given to the subjects in "Own" in appendix A.

4.2.2 Main experiment

Our main experiment, referred to as "Others"[17], followed like the baseline experiment Holt and Laury's (2002) MPL design. The subjects in "Others" formed the experiment group and consequently received treatment. We manipulated the experiment group by telling them to take risk on behalf of some unknown person in the other room, picked at random. The basic payoff matrix presented to subjects were the exact same as in the baseline experiment.

[15] Purchasing power parity (PPP) implies that the exchange rate between currencies of two countries should be equal to the ratio of the countries' price level of a common bask of goods (Steiner, 2002). The official exchange rate in 2007 was close to the exchange rate at the time of the experiment. So PPP exchange rate of USD/NOK = 9.13 (Heston, et al., 2009), e.g. NOK75/9.13 ≈ $8.
[16] Assuming standard Norwegian working hours per year: 230 days *7.5 working hours per day = 1725 hours.
[17] Chakravarty et al. (2009) denote their main experiment "Agent"

All the participants in the main experiment received a participation fee of NOK 100. Even though the subjects in "Others" earned considerably less than the subjects in "Own", we still think that NOK 100 is a significant sum given the fact that they spent maximum 30 minutes to complete the entire task.

The main experiment was held in two sessions, denoted session B and D, in which the participants completed two tasks. In compliance with the baseline experiment, task instructions were handed out sequentially so that the subjects did not have any information about the nature of the subsequent tasks when performing the first task. The nature of the two tasks was identical with that of "Own", apart from one important exception. Contrary to the baseline experiment, the subjects were told that their decisions would determine the earnings to a stochastically chosen person in the other room. In addition, we made it clear to the subjects that the person in the other room was not given this task at all and that his earnings, apart from the participation fee, depended solely on their decisions. The complete instructions given to the subjects in "Others" can be found in appendix B.

4.2.3 Theoretical predictions

Like Kahneman and Tversky (1979; 1992) we accept that EUT alone cannot explain how people make decisions under risk. It is obvious that most people do not make risk-neutral choices when they face a problem, but tend to be risk-averse. But it is not possible to characterize risk attitude under prospect theory without making some notifications about probability weighting and loss aversion, along with the curvature of the utility function (Harrison & Rutström, 2008). To be able to measure the subjects' risk aversion from the data in our experiment we will use a suitable statistical model called constant relative risk aversion (CRRA) that complies with EUT and not prospect theory. The mathematical expression of utility of income with CRRA can be defined as follows (Holt & Laury, 2002):

$$U(x) = \frac{x^{(1-r)}}{(1-r)} \qquad (5)$$

where x is the lottery prize and r is the coefficient of CRRA. CRRA is the parameter to be estimated and $r \neq 1$. $r=0$ corresponds to risk neutrality, $r<0$ to risk-loving, and $r>0$ to risk aversion. Let k denote possible outcomes in the lottery and p_k denote probability for each outcome (Harrison & Rutström, 2008). Under EUT, the expected utility is the probability weighted utility of each outcome in each lottery *i:*

$$EU_i = \sum_{k=1,K} (p_k \times U_k) \qquad (6)$$

The expected utility for each lottery pair is calculated for a candidate estimate of *r*, and the index calculated:

$$\nabla EU = EU_R - EU_L \qquad (7)$$

The notation EU_L and EU_R are respectively the "left" and "right" lottery. Using a standard cumulative function $\Phi(\nabla EU)$, the index based on latent preferences is then linked to the observed choice. A cumulative function shows the probability that a stochastic variable is less than or equal to a number (Stock & Watson, 2006). Using the function in the figure 6 (Harrison & Rutström, 2008, p. 70), the cumulative function takes any argument between ±∞ and transforms it into any number between 0 and 1, and we get the probit link function (Harrison & Rutström, 2008):

$$prob(choose\ lottery\ R) = \Phi(\Delta EU \qquad (8)$$

Figure 6 – Normal and logistic cumulative density functions

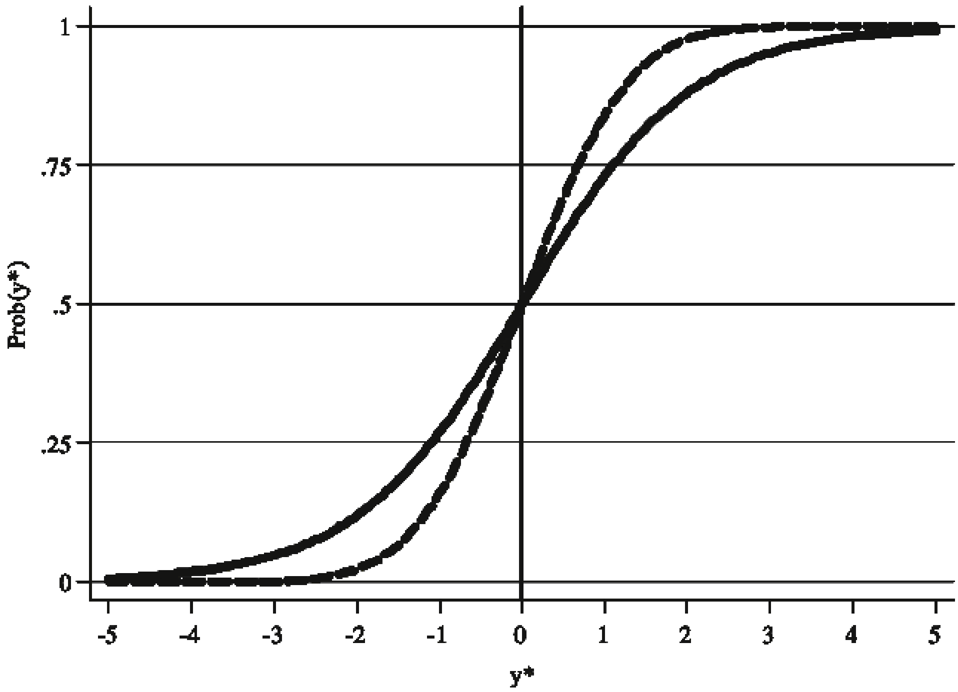


Figure 6 forms a critical link between observed binary choices, the latent structure generating the index y^*, and the probability of that index y^* being observed[18]. Let y^* denote the index defined in equation (7), and is linked to the observed choices by specifying that the R lottery is chosen when $\Phi(\nabla EU)>0{,}5$, which is also implied in equation (8). In other words the horizontal axis is a parameter of expected value of choosing lottery R over L, and the vertical axis is a parameter of the probability of choosing lottery R over L. Transferred to our experiment, the switch point for choosing lottery B over A would be in decision 5 assuming risk neutrality. The likelihood of the observed responses, conditional on the EUT and CRRA specifications being true, depends on the estimates of *r* given some functional form for the cumulative density function.

4.2.4 Hypotheses

When defining hypotheses, it is necessary to have a closer look at the findings in former studies of risk aversion in laboratory settings. What we find most relevant, is the work of Holt and Laury (2002, 2005), Harrison et al. (2005), Chakravarty et al. (2009) and Eriksen and Kvaløy (2009). Based on their work and our own assumptions of what might affect risk preferences, we have formulated two set of hypotheses. The first set of hypotheses concerns individual risk aversion, while the second relate to treatment effect. In addition, we also discuss possible demographic effects.

4.2.4.1 Hypothesis 1 – Individual risk aversion

By individual risk aversion we mean inferred risk attitudes from subjects in the main experiment "Own". Traditionally, people are predicted to be risk-neutral when making decisions under uncertainty (Ochs & Roth, 1989; Roth & Malouf, 1979), but research proves that subjects are (slightly) risk-averse with "normal" laboratory payoffs and that a few are risk-loving (Harrison, et al., 2005; Holt & Laury, 2002, 2005). Based on this we can derive the following set of hypotheses:

> *H_0: Subjects are (slightly) risk-averse when making risky decisions over their own money*
>
> *H_1: Subjects are risk-neutral when making risky decisions over their own money*

[18] The dashed line and the solid line are normal and logistic cumulative density functions, respectively.

When payoffs are scaled up however, subjects become sharply more risk-averse (Holt & Laury, 2002). Harrison et al. (2005) replicate and extend the study of Holt and Laury (2002) to show that Holt and Laury's (2002) design is confounded by an order effect[19]. Although Harrison et al. (2005) reaffirm that people become sharply more risk-averse when payoffs are scaled up, the increase in risk aversion is due to both order *and* scale effects. Because the subjects always completed the high real payment choice after the low real payment task (order effect), the pure scale effects cause smaller increases in risk aversion than suggested by Holt and Laury (2002). As a result of the corrections by Harrison et al. (2005), Holt and Laury (2005) provided new data without order effects. Nevertheless, we do not consider scale effects in our study, but rather use "normal" laboratory payoffs in order to investigate risk aversion.

4.2.4.2 Hypothesis 2 – Treatment effect

The literature is scant on the fundamental question of how people behave when taking risk on behalf of others (Eriksen & Kvaløy, 2009). To our knowledge, only Daruvala (2007), Eriksen and Kvaløy (2009) and Chakravarty et al. (2009) have addressed this issue. On the one hand, Eriksen and Kvaløy's (2009) results show that subjects take less risk with other people's money than with their own money. On the other hand Chakravarty et al. (2009) find that there is a tendency to exhibit less risk aversion when an individual makes a decision for an anonymous stranger. Based on these two studies, the second set of hypotheses can be defined as:

> *H_0: Subjects take the same amount of risk with other people's money as with their own money*
>
> *H_1: Subjects do not take the same amount of risk with other people's money as with their own money*

This hypothesis is the most important in our study. If we can reject the null hypothesis there is a significant treatment effect which will either support Eriksen and Kvaløy's (2009) or Chakravarty et al.'s (2009) results.

There is also empirical evidence for demographic effects that affect risk preferences (Chakravarty, et al., 2009; Eriksen & Kvaløy, 2009; Harrison, et al., 2005; Harrison & Rutström, 2008; Holt & Laury, 2002). This will be thoroughly discussed in section 5.3.5.

[19] An order effect is present when prior experience with one task affects behavior in a subsequent task (Harrison, et al., 2005).

4.2.5 Experiment procedure

In total, 80 (undergraduate and graduate) students participated in the experiment which was conducted in four sessions. Subjects in sessions A and C took part in the baseline experiment "Own" while the subjects in sessions B and D participated in the main experiment "Others". All students were attending the University of Stavanger in Norway at the time of the experiment, and were recruited by e-mail. In the e-mail they were invited to join an economic experiment in which they had the opportunity to earn a nice sum of money. Like Holt and Laury (2002) and Chakravarty et al. (2009) we conducted the experiment using pen and paper and physical drawings with a ten-sided die.

In the baseline experiment "Own" we had 40 subjects who took risk on behalf of themselves. The 40 subjects who participated in the main experiment "Others" took risk on behalf of others. As mentioned, "Own" is a replication of Holt and Laury's (2002) experiment, and "Others" is a replication of Chakravarty et al.'s (2009) experiment. For the "Others" experiment we needed 40 more subjects, whose only role was to serve as passive clients and receive the payoffs from the agents in "Others". To save on both time and people we decided to use the subjects in "Own" as clients. In sessions A and B, the participants in the baseline experiment showed up half an hour before the participants in the main experiment. When the agents in "Others" had completed filling in the decision sheets, these were handed to the experimenter in "Own" to calculate earnings. Anyhow, the passive clients had to wait for quite some time, so based on this experience all subjects showed up at the same time for sessions C and D.

As we started the experiment, an envelope with instructions was handed out in a stochastic order to ensure that the ID number the subjects received was given to them randomly. The agents in "Others" were told that they were matched with a stochastically chosen person in the other room at the beginning of the experiment. The clients in "Others" were however not informed about this before right at the end of the experiment, and they did not observe the choices the agents made on their behalf. All instructions were given both written and verbally during the sessions.

5 Data analysis and results

In this chapter we will analyse the data from the experiment, present the results and discuss the findings. Firstly we take a closer look at the sample and possible sample selection bias. Secondly we report and examine average payoffs, safe choices and implied CRRA intervals in order to reveal the subjects' risk aversion. Thirdly we perform an OLS regression analysis based on our findings and draw conclusions concerning possible treatment and demographic effects. The data analysis have been conducted with the statistical analysis software SPSS (Statistical Package for the Social Sciences).

5.1 Sample

Our aim when recruiting subjects to the experiment was primarily to obtain a cross-section of all the students at the University of Stavanger, i.e. a representative sample. As mentioned, 80 subjects participated in the experiment all together. The baseline experiment "Own" was conducted in two sessions, A (15 subjects) and C (25 subjects). The main experiment "Others" was also conducted in two sessions, B (15 subjects) and D (25 subjects). In addition, the 40 subjects in "Own" served as passive clients in "Others".

As to sex, we had 43 male and 37 female subjects. 22 males and 18 females participated in "Own", while 21 males and 19 females took part in "Others". We argue therefore that the distribution of gender was quite even.

Regarding age, the participants ranged from 20 to 50 years, and the average age was approximately 25 years. In "Own" the minimum and maximum age was 20 and 33 years, respectively, with 24.5 years on average. The subjects in "Others" ranged from 20 to 50 years, and the average age was about 25 years. Considering that both undergraduate and graduate students[20] participated in the experiment, we claim that the sample was representative in terms of age.

The participants in the experiment were either undergraduate or graduate students. Both in "Own" and "Others", there were 67.5 % undergraduate and 32.5 % graduate students. Concerning field of study, students from all twelve different fields were represented in the study, but the vast majority was engineers, economists or teachers. Compared to the

[20] "Undergraduate" refers to Bachelor's Degree students, while "graduate" refers to Master's Degree students

population, i.e. all the students at the University of Stavanger, class standing and field of study are nicely reflected in the data.

Given the arguments above we conclude that the sample is representative. Consequently, the results from the studies can be generalized to the population. To ensure that everyone had the possibility to participate, the recruitment e-mail was sent to every single student and the sessions were not conducted during class time. Complete demographic data can be found in appendix D.

5.1.1 Sample selection bias

Although we maintain that our sample is representative for the population, the sample might suffer from bias. Hence sample selection is an important factor in experiments, and Harrison and Ruström (2008) underpin that experimental economists should pay much attention to the process that leads subjects to participate if they are to draw reliable inferences in settings were risk attitudes play a role.

Randomization to treatment is basic to statistical control in the design of experiments (Harrison & Rutström, 2008). *Randomization bias* occurs if the inferred risk preferences from our experiment do not represent the risk preferences of the population. Individuals have different preferences towards taking on risk, and randomization implies some uncertainty about treatment condition. The way laboratory experiments measure treatment effect could be directly affected by randomization bias (see e.g. Harrison & List, 2004; Heckman & Smith, 1995). In the context of an economic experiment, there are two latent sample selection effects that might cause this bias (Harrison & Rutström, 2008). Firstly, participants volunteered for the experiment, thus it is possible that we attracted people that are *least* averse to being exposed to risk given the inherent risk in randomization to treatment (Harrison, Lau, & Rutström, 2009). Secondly, we offered a fixed, non-stochastic participation fee to encourage attendance which could tempt *more* risk-averse subjects to participate (Camerer & Lovallo, 1999). Cadsby, Song, and Tapon (2007) and Dohmen and Falk (2006) conducted laboratory tests of risk attitudes where they allowed subjects to choose between tasks rewarded by fixed or performance-variable payments. Since their results show that more risk-averse subjects selected tasks with fixed rewards rather than uncertain rewards depending on performance, we found that the best solution to escape randomization bias was to offer a non-random show-up fee combined with a random payoff from the lottery choice task. To avoid both least risk-averse and more risk-averse participants, subjects were only told that they could earn a nice sum of money in the recruitment e-mail. This implied that they were guaranteed some financial remuneration and that they could possibly earn additional money.

5.1.2 Experimental treatments

A summary of our experimental lottery-choice treatments is presented in table 2[21]. The table shows each subject's generated payoff and average payoffs in "Own" and "Others". As to average payoffs, we exclude the 100 NOK participation fee.

Table 2 – Summary of lottery choice payoffs

	Number of subjects					
	Lottery A payoffs		Lottery B payoffs			
Treatment	NOK 75	NOK 60	NOK 145	NOK 4	Total number of subjects	Average payoffs
"Own"	8	11	19	2	40	NOK 100.58
"Others"	6	10	19	5	40	NOK 95.63

It does not appear to be large differences in payoffs in the baseline and the main experiment. Although average payoffs are somewhat higher in "Own" than "Others", this is most likely due to chance thus we cannot infer any risk preferences from the table. In order to decide whether the subjects in "Own" generally took more risk when deciding over lottery choices than the subjects in "Others" (or vice versa) a thorough investigation is needed. This is provided in the next section.

5.2 Risk aversion

A variety of statistical models may be used to analyze the Holt and Laury (2002) data, but mainly two models are typically applied to infer individual risk attitudes (Harrison & Rutström, 2008). One model e.g. Holt and Laury (2002) use to evaluate the data, is to look at the average number of safe choices[22] for each of the ten-paired lottery choice decisions. Another model is the interval regression model used by e.g. Chakravarty et al. (2009). In this model, the dependent variable is the CRRA interval that each subject implicitly revealed

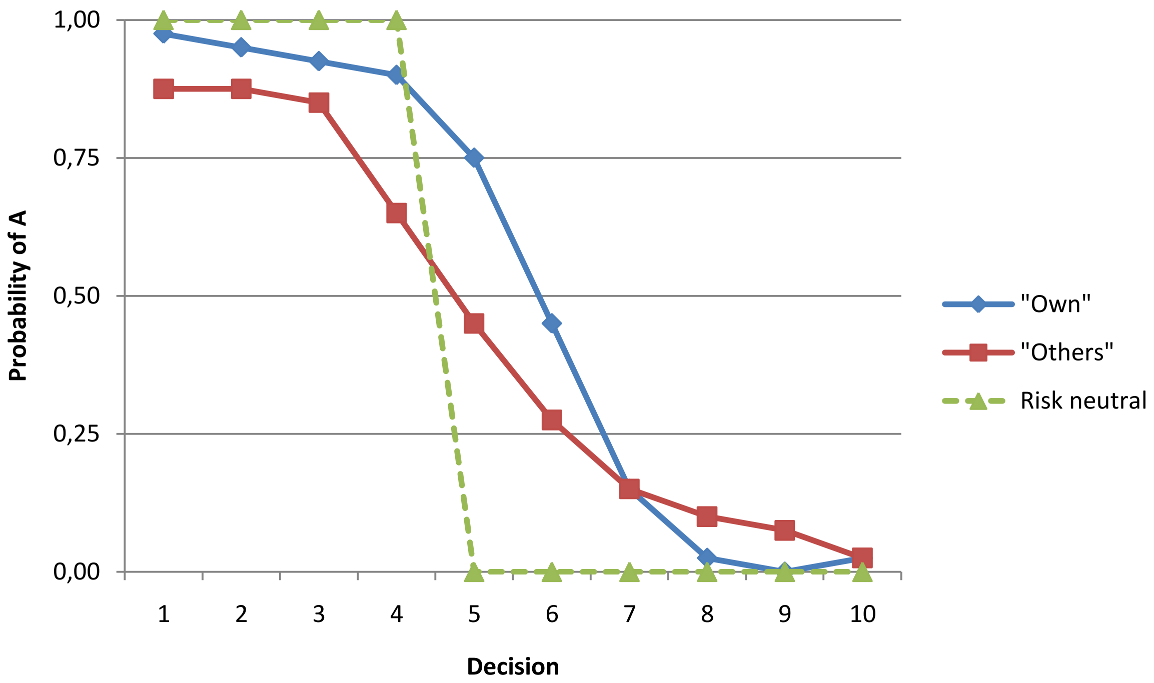
[21] For all lottery choices and payoffs, see appendix C.
[22] Number of safe choices refers to how many times the subject chose the safe lottery A over the risky lottery B.

when they switched from lottery A to lottery B. We analyse the data from our experiment using both of the two models mentioned above.

5.2.1 Risk aversion revealed by safe choices

Most of the subjects in treatment "Own" and "Others" chose the safe lottery A when the probability of the higher payoff was small, and then switched to the risky lottery B without ever crossing over to lottery A again. This finding is consistent with existing research (Chakravarty, et al., 2009; Harrison, et al., 2005; Holt & Laury, 2002, 2005). In all four sessions 16 of 80 persons (20 %) switched back from lottery B to A; 6 subjects in "Own" and 10 subjects in "Others". The percentage of switching subjects was therefore somewhat higher in "Others" (25 %) compared to "Own" (15 %). Nevertheless, there is still a clear division point between clusters of safe and risky choices with only a few "incorrect" choices on each side. Thus, the total number of safe choices can be used as an indicator of risk aversion (Holt & Laury, 2002). The average proportion of safe choices for each of the ten decisions is presented in figure 7.

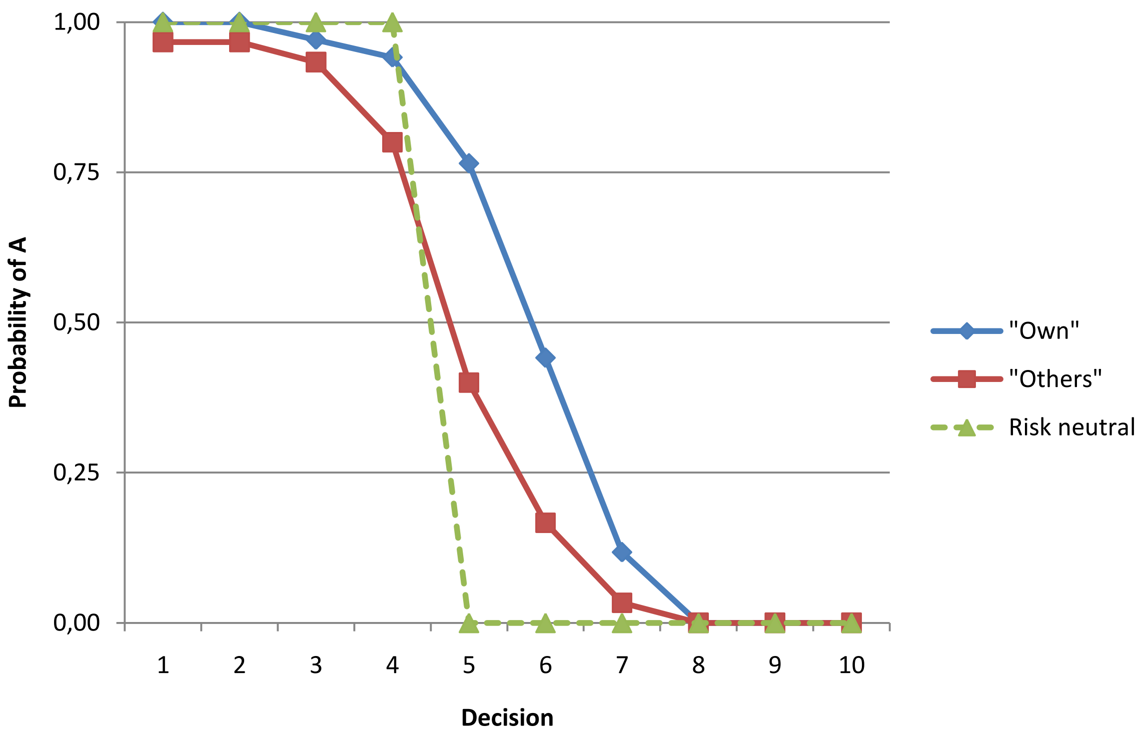
Figure 7 – Proportion of safe choices in each decision



The horizontal axis shows the decision row number, and the vertical axis shows the probability that the subjects chose A for that decision. The average choice made by the subjects in "Own" and "Others" is represented by the solid blue and red line, respectively. The dashed green line indicates predicted choices under a risk-neutral assumption, i.e. a probability of 1 that the safe choice is selected for the first four decisions followed by a probability of 0 that the risky choice is selected for the remaining six rows. As mentioned earlier, a risk-neutral subject pick lottery A until the expected value of lottery B exceeds the expected value of lottery A. Subjects that pick the safe option A more than the risk-neutral prediction are considered to be risk-averse.

Like Holt and Laury (2002, p. 1648) and Chakravarty et al. (2009, p. 13), our series of choice frequencies indicate that the subjects in "Own" tend to be risk-averse as the blue line lies to the right of the dashed green, risk-neutral line. However, the average choices of the subjects in "Others" seem to deviate from Chakravarty et al.'s figure (2009, p. 13). Consequently, we found it necessary to adjust the fraction choosing the safe option A in order to see if that could alter our results. What we did was to exclude all 16 subjects who switched back from lottery B to A, and the adjusted average proportion of safe choices for each of the ten decisions is presented in the figure 8.

Figure 8 – Adjusted proportion of safe choices in each decision



If we compare figure 7 with figure 8 we see that there are only minor adjustments to the blue line that expresses the "Own" subjects' average proportion of safe choices. Hence we can still maintain that the subjects in "Own" tend to be risk-averse. But if we look at the "Others" subjects' fraction of safe choices, there are some modifications to the red line. Especially for the five last decisions, the probability of choosing lottery A in "Others" drops when we exclude the subjects that crossed over from the risky to the safe lottery. After this adjustment, figure 8 shows the same trend as Chakravarty et al. (2009, p. 13). There are clear indications of a more risk-neutral behaviour among subjects in "Others" compared to "Own" as the red line lies to the left of the blue line and thus closer to the risk-neutral line.

5.2.2 Risk aversion revealed by CRRA intervals

The interval regression model has been used to study effects of experimental conditions while controlling for characteristics of the sample and the conduct of the experiment (Harrison & Rutström, 2008). It was first proposed by Coller and Williams (1999) for an MPL experimental task. The implied bounds on the CRRA coefficient can be calculated for each row of the payoff matrix (see table 1), and CRRA intervals are as a matter of fact reported by both Holt and Laury (2002, p. 1649). Accordingly, risk aversion based on lottery choices from our baseline experiment is presented in table 3:

Table 3 – Risk aversion classifications based on safe lottery choices in "Own"

Number of safe choices	Number of subjects	Range of CRRA	Risk preference classification	Proportion of choices	Cumulative proportion of choices
0-1	0	CRRA < -0.95	Highly risk-loving	0.0 %	0.0 %
2	1	-0.95 < CRRA < -0.49	Very risk-loving	2.5 %	2.5 %
3	1	-0.49 < CRRA < -0.15	Risk-loving	2.5 %	5.0 %
4	9	-0.15 < CRRA < 0.15	Risk-neutral	22.5 %	27.5 %
5	13	0.15 < CRRA < 0.41	Slightly risk-averse	32.5 %	60.0 %
6	12	0.41 < CRRA < 0.68	Risk-averse	30.0 %	90.0 %
7	4	0.68 < CRRA < 0.97	Very risk-averse	10.0 %	100.0 %
8	0	0.97 < CRRA < 1.37	Highly risk-averse	0.0 %	100.0 %
9-10	0	CRRA > 1.37	Stay in bed	0.0 %	100.0 %

The logic behind the table is that each subjects' number of safe choices implicitly reveals his range of CRRA. This range then corresponds to a certain risk preference classification. For example, a subject with three safe choices reveals a CRRA interval from -0.49 to -0.15, and can therefore be classified as risk-loving. The second last column to the right shows that 2.5 % of the subjects in "Own" tend to be risk lovers, and the right column shows that 5% of the subjects are at least risk-loving. In compliance with the previous section and Holt and Laury's (2002) results, the majority of the subjects in "Own" seem to be (slightly) risk-averse with a CRRA range between 0.15 and 0.41. However, a more formal statistical analysis is required before we can draw a conclusion. This is provided in the next section.

Similarly, risk aversion based on lottery choices from our main experiment is described in table 4:

Table 4 – Risk aversion classifications based on safe lottery choices in "Others"

Number of safe choices	Number of subjects	Range of CRRA	Risk preference classification	Proportion of choices	Cumulative proportion of choices
0-1	2	CRRA < -0.95	Highly risk-loving	5.0 %	5.0 %
2	1	-0.95 < CRRA < -0.49	Very risk-loving	2.5 %	7.5 %
3	7	-0.49 < CRRA < -0.15	Risk-loving	17.5 %	25.0 %
4	14	-0.15 < CRRA < 0.15	Risk-neutral	35.0 %	60.0 %
5	8	0.15 < CRRA < 0.41	Slightly risk-averse	20.0 %	80.0 %
6	5	0.41 < CRRA < 0.68	Risk-averse	12.5 %	92.5 %
7	2	0.68 < CRRA < 0.97	Very risk-averse	5.0 %	97.5 %
8	0	0.97 < CRRA < 1.37	Highly risk-averse	0.0 %	97.5 %
9-10	1	CRRA > 1.37	Stay in bed	2.5 %	100.0 %

There is a clear tendency that the subjects in "Others" (table 4) tend to be less risk-averse compared to the subjects in "Own" (table 3). While subjects in the baseline experiment are generally (slightly) risk-averse, subjects in the main experiment appear to be closer to risk-neutral with an average CRRA interval between -0.15 and 0.15. This is consistent with the findings of Chakravarty et al. (2009) and confirms the trend shown in the adjusted average proportion of safe choices for each of the ten decisions. Of course, this result only reflects averages, so we have to investigate this issue further before we can conclude that people in general tend to take on more risk when making decisions on behalf of others.

One problem that arises when calculating the CRRA interval is how to interpret subjects who switch back and forth between safe and risky choices. Although Holt and Laury (2002) did not take this issue into account, Harrison and Rutström (2008) provide a method to deal with this problem. We used this method in order to make our data comparable with Chakravarty et al. (2009) by adjusting the switching subjects' estimated CRRA coefficients accordingly. For instance, one subject switched from option A to option B after five safe choices, then chose option A one more time before switching back to B for the remaining four rows. Although such subjects provide less precise information than subjects that only switch once (Harrison & Rutström, 2008), this implies that he revealed a CRRA interval between 0.15 and 0.97. After calculating the CRRA intervals for all the 16 switching subjects in "Own" and "Others", we have the data necessary to estimate the dependent variable in a regression model.

5.2.3 Individual risk aversion based on safe choices and CRRA

As discussed earlier, the findings in the two previous sections strongly indicate that people in general tend to be (slightly) risk-averse when making decisions under uncertainty. Average number of safe choices, range of CRRA and risk preference classification is presented in table 5. For comparison, we have included results from former experiments.

Table 5 – Individual risk aversion classifications based on safe lottery choices

Experiment	Safe choices	Range of CRRA	Risk preference classification
Holt and Laury (2002)	5.2	0.15 < CRRA < 0.68	(Slightly) risk-averse
Harrison et al. (2005)	5.3	0.15 < CRRA < 0.68	(Slightly) risk-averse
Holt and Laury (2005)	5.7	0.15 < CRRA < 0.68	(Slightly) risk-averse
Chakravarty et al.'s (2009) baseline experiment "Self"	6.4	0.41 < CRRA < 0.97	(Very) risk-averse
Our baseline experiment "Own"	5.2	0.15 < CRRA < 0.68	(Slightly) risk-averse

All the experiments in the left column are based on Holt and Laury's (2002) MPL design, and the first three experiments from the top used the original payoffs of $2, $1.60, $3.85 and $0.1. Chakravarty et al.'s (2009) prize values on the other hand were $65, $52, $125 and $3.25, while we used payoffs of \$8, \$6.4, \$15.4 and \$0.4[23]. The second column from the left shows average number of safe choices for each experiment, and according to Holt and Laury (2002, p. 1649) these numbers imply range of CRRA and corresponding risk preference classifications. For example, 5.2 safe choices imply a CRRA interval between 0.15 and 0.68 which can be classified as slightly risk-averse to risk-averse.

Consistent with Holt and Laury (2002, 2005) and Harrison et al. (2005), we find that people in general are (slightly) risk-averse with "normal" laboratory payoffs. Chakravarty et al. (2009)'s subjects are (very) risk-averse, but this can be explained by higher prize values with a scaling of 32.5 times the baseline prizes of Holt and Laury (2002). As mentioned earlier, people become sharply more risk-averse when payoffs are scaled up (Harrison, et al., 2005; Holt & Laury, 2005). Descriptive statistics from our experiment shows that the average CRRA estimate in "Own" is 0.28 (standard deviation = 0.36), i.e. they reveal slightly risk-averse preferences. Thus we can reject the null hypothesis that people are risk-neutral when making decisions under uncertainty:

Result 1. *Subjects are (slightly) risk-averse when making risky decisions over their own money.*

In order to decide if there are significant treatment and demographic effects that effect individual risk aversion, we now turn to the regression analysis.

5.3 Regression analysis

For simplicity, we have used an OLS regression model instead of the interval regression model. Since the interval regression model is just an extension of OLS (Harrison & Rutström, 2008), we do not expect this to result in large differences. First we will describe the theoretical assumptions of the model and then we will provide the results from the OLS regression. In the end we will test if the assumptions hold.

5.3.1 Theoretical assumptions

Most applied economics is concerned with analysing data in order to unveil general behaviour patterns that helps us understand the past, and possibly in predicting the future (Sydsæter &

[23] These prize values are calculated using purchasing power data (see section 4.2.1 for details).

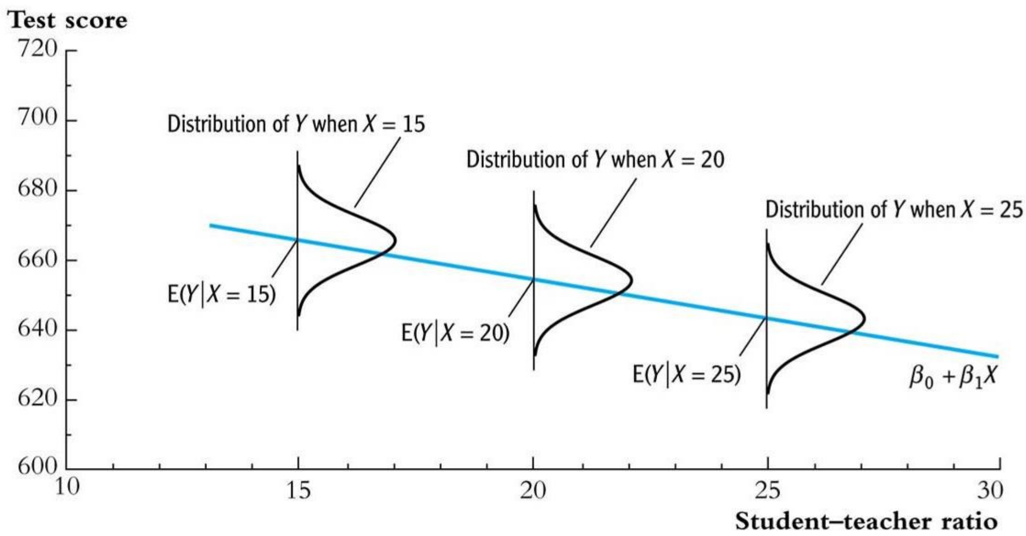
Hammond, 2008). For example, price and quantity data for a certain commodity like gas may be used to estimate a demand curve. Again, this might be used to predict how future price changes will affect demand. The most common technique for estimating such a curve is OLS. The estimator that minimizes the sum of squared residuals is called the OLS estimator (see e.g. Stock & Watson, 2006). OLS is a method for estimating the unknown parameters in a linear regression model. This method minimizes the sum of squared distances between the observed responses in the dataset, and the responses predicted by the linear approximation. Closeness is measured by the sum of the square mistakes made in prediction *Y* given *X*. The example below shows a multiple regression model with *k* explanatory variables.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + u_i, \qquad i = 1,\ldots,n \tag{9}$$

The regression model contains the intercept (β_0), explanatory variables (β_k), the error term (u_i) and Y_i is i^{th} observation of the dependent variable. X_{ki} are the i^{th} observation of each of the *k* regressors. β_k is the slope coefficient of X_{ki} and is the expected change in Y_i resulting from changing X_{ki} holding all other *X*'s constant. The intercept β_0 is simply the expected value of *Y* when all the *X*'s equal 0. In order to draw any inferences to the population based on a sample when using OLS, there are several assumptions that have to be fulfilled (Stock & Watson, 2006):

1. **The conditional distribution of u_i given X_i has a mean of zero**
   The residual contains "other factors", and the assumption is a formal mathematic statement which asserts that these factors are unrelated to *Xi* in the sense that, given a value of X_i, the mean of the distribution of these other factors is zero. This can be expressed mathematically: $E(u_i \mid X_i) = 0$. Below is an illustration of a homoscedastic error term u_i (Stock & Watson, 2006, p. 127). The variance of the conditional distribution of u_i given X_i is constant for $i = 1,\ldots,n$ and in particular does not depend on X_i.

Figure 9 – Conditional probability distributions and population regression line (homoscedasticity)



The figure shows the conditional probability of test scores for districts with class sizes of 15, 20 and 25 students. The mean of the conditional distribution of test scores, given the student-teacher ratio, $E\,(Y\,|\,X)$, is the population regression line $\beta_0 + \beta_1 X_1$. At a given value of X, Y is distributed around the regression line and the error, $u = Y - (\beta_0 + \beta_1 X_1)$, has a conditional mean of zero for all values of X.

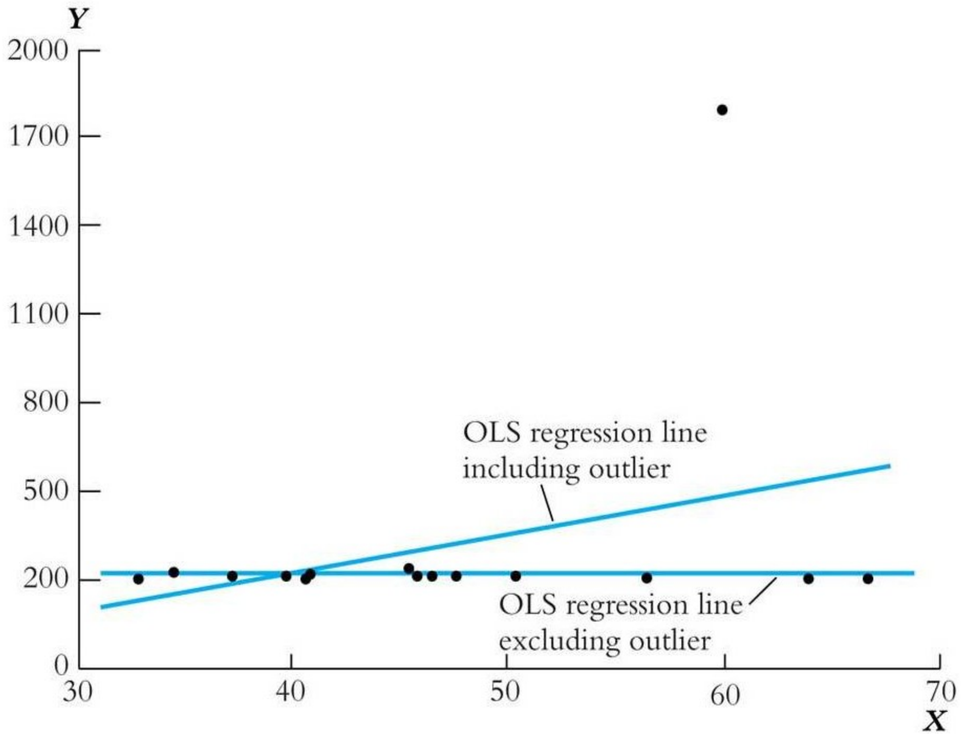
2. **Independently and identically distributed**

   Assumes that (X_i, Y_i), $i = 1,\ldots,n$ are independently and identically distributed across the observations. This means that all the observations must be drawn by simple random sampling form a single large population.

3. **Large outliers are unlikely:**

   Simply states that observation of X_i and Y_i made far outside the usual range of the data are unlikely. In other words the X and Y have finite kurtosis. The result of large outliers is meaningless values of β_1. An illustration the sensitivity of OLS to large outliers is shown in figure 10 (Stock & Watson, 2006, p. 130).

Figure 10 – The sensitivity of OLS to large outliers



4. **No perfect multicollinearity:**

   Presence of perfect multicollinearity makes it impossible to compute the OLS estimator. None of the regressors can be a perfect linear function of another. If so, the regressors are said to be perfect multicollinear.

5.3.2 OLS regression model

The dependent variable in our regression model is the calculated CRRA coefficient *r* for each subject. Following Holt and Laury (2002), CRRA coefficients are found by simply calculating the mean of the CRRA intervals (see e.g. Frijns, Koellen, & Lehnert, 2008). For instance, the CRRA coefficient is 0.545 for a risk-averse subject that has range of CRRA between 0.41 and 0.68. The explanatory variables are *treatment*, *female, parents' income*, *father's education* and *mother's education*. Our goal is primarily to see if there is a significant treatment effect and sequentially if the introduction of demographic variables alters the possible treatment effect. The results from the OLS regression are presented in table 6:

Table 6 – Multiple regression estimates

Dependent variable: Constant relative risk aversion coefficient (CRRA)					
Regressors	Model 1	Model 2	Model 3	Model 4	Model 5
Treatment	-0.264*	-0.269**	-0.266*	-0.279*	-0.315**
	(0.105)	(0.103)	(0.115)	(0.113)	(0.115)
Female		0.208*	0.222	0.222	0.157
		(0.104)	(0.116)	(0.117)	(0.117)
Parents' income			0.170	0.261*	0.289*
			(0.123)	(0.130)	(0.131)
Father's education				-0.138	-0.113
				(0.074)	(0.076)
Mother's education					-0.105
					(0.075)
Intercept	0.282**	0.188*	0.095	0.354*	0.511*
	(0.075)	(0.087)	(0.103)	(0.173)	(0.205)
Summary statistics					
SER	0.471	0.462	0.469	0.461	0.457
R^2	0.074	0.120	0.161	0.204	0.229
	0.062	0.097	0.121	0.153	0.166

* statistically significant at the 5 % level (p-value = 0.05)

** statistically significant at the 1 % level (p-value = 0.01)

The first five rows show the beta coefficients and standard errors (in parenthesis) of the regressors. If the beta coefficients have a negative sign, they have negative effect on the dependent variable and vice versa. Negative effect on the dependent variable implies a lower estimated CRRA coefficient and therefore less risk-aversion. The intercept is presented in row six. Regarding the regressors, they are defined as follows:

- *Treatment*: 0 = subjects in "Own", 1 = subjects in "Others"
- *Female*: 0 = male, 1 = female
- *Parents' income*: 0 = parents earned less than NOK 999 000, 1 = parents earned more than NOK 1 000 000
- *Father's education*: 1 = upper secondary school or less, 2 = bachelor's degree or equivalent (1-3 years of higher education), 3 = master's degree or equivalent (4-5 years of higher education), 4 = doctor's degree
- *Mother's education*: same scale as father's education

The summary statistics in the last three rows describe how well the OLS regression line fits the data. High measures of fit means that the regressors account for much of the variation in the dependent variable, and that the observations are tightly clustered around the regression line (see e.g. Stock & Watson, 2006). *SER* means the standard error of the regression, R^2 is the coefficient of determination and   is the adjusted R^2. *SER* is an estimator of the standard deviation of the regression error u_i. It is a measure of how far the observation Y_i typically is from the predicted value, i.e. the regression line. R^2 measures the fraction of the sample variance of Y_i that is explained by X_i, and it ranges between 0 and 1. R^2 equal to 1 means that all of the variance of the dependent variable is explained by the explanatory variables and conversely. Unless the estimated coefficient on the added regressor is exactly zero, R^2 always increases when a new variable is added in a multiple regression. So an increase in R^2 does not mean that adding a variable actually improve the fit of the model. One way to correct for this is to use adjusted R^2, because it adjusts R^2 according to sample size and number of explanatory variables.

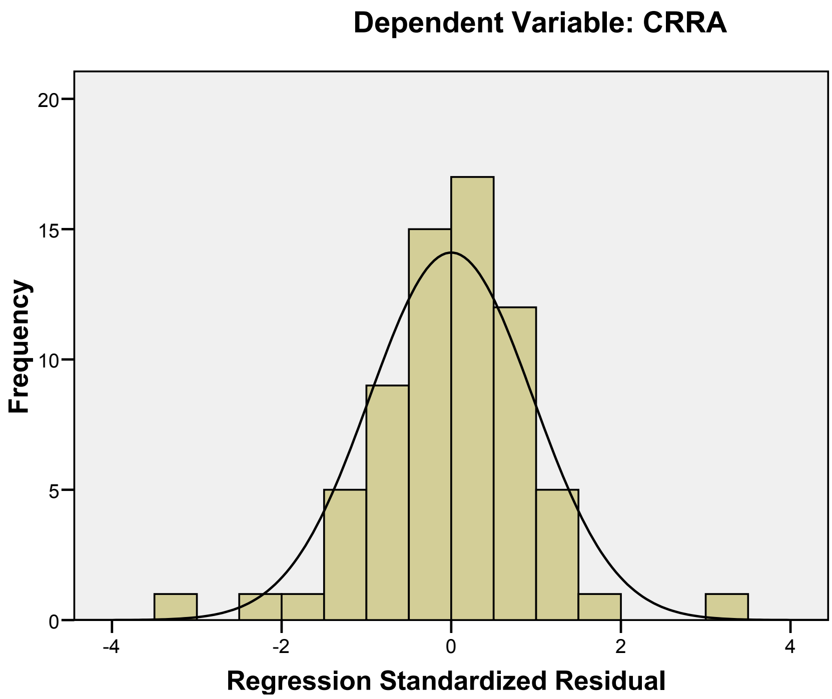
As table 6 shows we have calculated five different models, adding one more regressor for each column. There seems to be a clear treatment effect, significant at the 1-5 % level, even when we control for demographic effects. This means that subjects in treatment "Others" exhibit less risk-aversion than in treatment "Own". The negative beta coefficients of father's and mother's education indicate that subjects whose parents have some higher education take on more risk than others, but these beta coefficients are not significant. Consequently, we cannot say that this effect is statistically valid. Females and high-earning parents seem to take less risk than men and medium/low-earning parents. However, we must investigate these two effects further before we can draw a conclusion. In order to decide which of the five models that is best fitted to explain the variation in the CRRA coefficient, we have to compare the models with respect to *SER* and adjusted R^2. Model 5 have the highest measures of fit due to the lowest *SER* and highest adjusted R^2. An F-statistic test also shows that the explanatory variables are statistically significant at the 5 % level[24].

5.3.3 Test of theoretical assumptions

To test if the OLS assumptions hold, we have used the statistical analysis software SPSS (Statistical Package for the Social Sciences) to evaluate model 5. As explained in section 5.3.1 there are four assumptions in a linear regression with multiple regressors: *the conditional distribution of* u_i *given* X_i *has a mean of zero*, *independently and identically distributed*, *large outliers are unlikely* and *no perfect multicollinearity*.

To check if the conditional distribution of u_i given X_i has a mean of zero, we can look at a histogram that displays the regression standardized residuals and the bell-shaped indication normal distribution curve:

Figure 11 – Histogram of regression standardized residuals and normal distribution curve

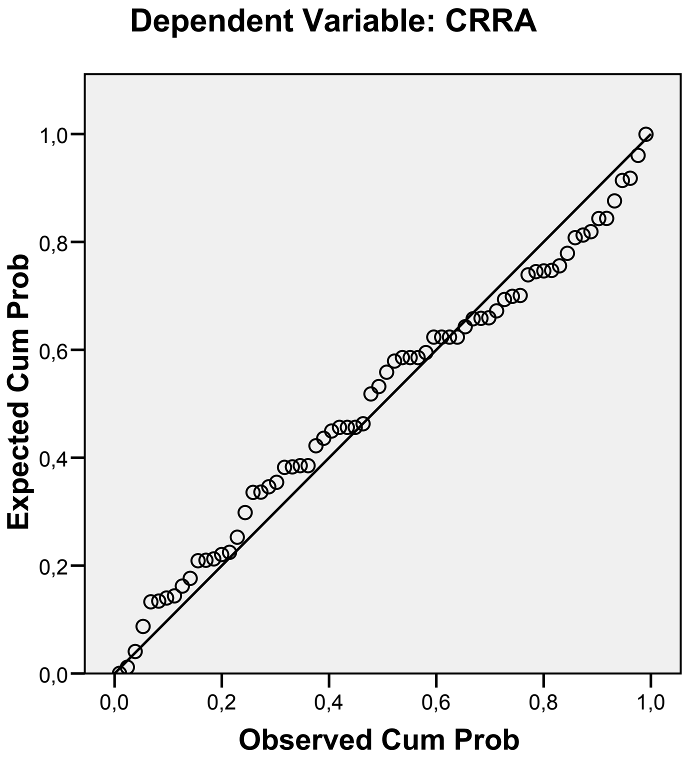


[24] Critical value of an F distribution with q = 4 restrictions and n = 80 is 2.49.

$$F = \frac{\bar{R}^2{}_{unrestricted} - \bar{R}^2{}_{restricted}\,/q}{1-\bar{R}^2{}_{restricted}/(n-k_{unrestricted}-1)} = \frac{(0.229-0.074)/4}{(1-0.229)/(80-5-1)} = 3.72 \ > 2.49$$

A comparison of the regression standardized residuals and the normal distribution curve indicate that the residuals are normally distributed. In addition, we can look at a normal probability plot of the regression standardized residuals:

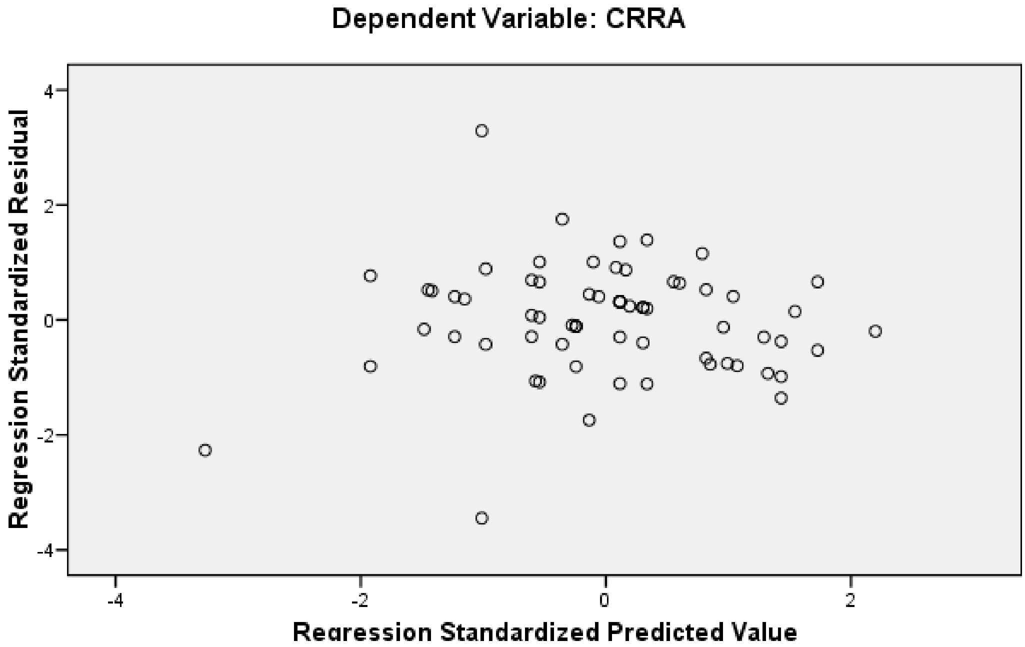
Figure 12 – Normal probability plot of the regression standardized residuals



Perfectly normally distributed residuals should follow the sloping line, while observed residuals are indicated with circles. Figure 12 above also suggests that the standardized residuals are normally distributed because the observed residuals follow the line closely with no considerable deviations. Evidently, assumption one holds; the conditional distribution of u_i given X_i has a mean close to zero. Based on the normal probability plot we can also infer that assumption three holds: large outliers are unlikely.

The next step is to control for homoscedasticity. One way to do this is to look at a scatter plot of standardized residuals as a function of predicted values of the dependent value:

Figure 13 – Scatterplot of the regression standardized residuals and predicted values



As shown in the figure, there are no clear implications of sharply increasing or decreasing variance. This tells us that the homoscedasticity assumption holds: the variance of the conditional distribution of u_i given X_i does not depend on X_i.

The second assumption states that all the observations must be drawn by simple random sampling from a single large population. Following our controlled laboratory experimental design and the discussion in section 5.1, we claim that subjects are independently and identically distributed.

Assumption four assumes no perfect multicollinearity. To decide whether the data suffers from multicollinearity, we can use the variance inflation factor (*VIF*). *VIF* measures how much the variance of an estimated beta coefficient increase due to collienearity and should not exceed a value of 5 (Gripsrud, et al., 2004) . As *VIFs* range between 1.07 and 1.30, there are no signs of perfect multicollinearity in the data. None of the regressors are a perfect linear function of another.

After testing the theoretical assumptions, we conclude that the OLS regression model holds. Nevertheless, further statistical analyses are imperative to decide whether the treatment and demographic effects are significant. Since the sample is relatively small with 40 subjects in each treatment, we cannot use the parametric t-test to verify these results (Wenstøp, 2006). Instead we use non-parametric Mann-Whitney U-tests.

5.3.4 Treatment effect

In this section we present the main findings related to treatment effect in our experiment. Table 7 displays descriptive statistics of safe choices and CRRA.

Table 7 – Average safe choices and CRRA estimates for treatments "Own" and "Others"

	Treatment "Own"		Treatment "Others"		Mann-Whitney U-test	
Test variable	Mean	Std. dev.	Mean	Std. dev.	z-value	p-value
Safe choices	5.23	1.14	4.33	1.62	-3.09	0.00
CRRA	0.28	0.36	0.02	0.56	-2.68	0.01

The table presents the mean and standard deviation for the average amount of safe choices and range of CRRA in treatment "Own" and "Others". It also gives the Mann-Whitney z-values and corresponding two-tailed p-values for differences in amount of safe choices and differences in the degree of CRRA between the two treatments. In both treatments the sample size is 40 subjects.

We have averaged the amount of safe choices and the degree of CRRA from both treatments and compared them. We use non-parametric statistical tests in order to determine the statistical validity of these differences. The results present both the z-value, which are transformations of the U-statistic given by the Mann-Whitney U-test, and the p-value. In our second set of hypothesis, the null hypothesis predicts no systematic differences between treatments while the alternative hypothesis predicts systematic differences between treatments with an unknown direction of the differences. Thus we use p-values that are given for two-tailed significance levels.

There is a highly significant treatment effect for both safe choices and CRRA ($p<0.01$). Based on these findings we can reject the null hypothesis. Thus we have:

Result 2. *Subjects take more risk with other people's money than with their own money.*

This reaffirms the findings of Chakravarty et al. (2009) and contradicts the result of Eriksen & Kvaløy (2009). In order to compare in-sample responses, Chakravarty et al. (2009) let their subjects either make decisions over their own money first, and then over another person's money, or vice versa. Thus our findings serve as a robustness check because we let different people perform the tasks in the baseline and main experiment. Chakravarty et al. (2009)'s results are seemingly not confounded by an order effect. If we assume that subjects exhibit less feelings over their clients' money than their own, our second result supports the *Risk-as-feelings* hypothesis in the population from which our sample is drawn.

There are several possible reasons why our result contradicts the result of Eriksen and Kvaløy (2009). They conducted a repeated game based on Gneezy and Potters' (1997) design, and find that people behave consistently with MLA over their clients' money and take less risk with their clients' money than with their own. In contrast to a repeated game, we replicated Chakravarty et al.'s (2009) study, which is a single played game. Therefore our subjects did not have the opportunity to exhibit MLA. While Eriksen and Kvaløy (2009) conducted a fully computerized experiment, our subjects used pen and paper and threw the die themselves. This could possibly trigger an illusion of control (see e.g. Langer, 1975), making the subjects in "Others" less risk-averse on behalf of their clients. In addition, our design is based on EUT, while their design is based on PT. The different framing could also be a possible answer to the contradictory findings. Our design had a focal point between choice 4 and 5 in order to be risk-neutral and the risk-rate and lottery winnings were fixed. But in Eriksen and Kvaløy's (2009) experiment the risk-rate and amount of investments were set by the subjects themselves and a focal point was nonexistent. Their subjects could therefore experience loss aversion when loosing the invested money which can trigger a higher degree of risk aversion in subsequent decisions.

5.3.5 Demographic effects

In the OLS regression model we also controlled for demographic effects in order to see if they affected the treatment effect. The following section focuses on possible gender and income effects in risk-taking. Although Chakravarty et al. (2009) prove that subjects whose parents have some higher education take less risk than other subjects, we do not consider parents' education. As the regression model clearly show the beta coefficients of father's and mother's education are far from significant with p-values of 0.14 and 0.16, respectively.

5.3.5.1 Gender effect

As to gender, Holt and Laury (2002) find that men in general are slightly less risk-averse than women, but this finding has later been rejected (Harrison, et al., 2005; Harrison & Rutström,

2008). Eriksen and Kvaløy (2009) and Chakravarty et al.(2009) reaffirm that there are no gender effect when people take risk on their own behalf. However, Eriksen and Kvaløy (2009) find that men exhibit MLA behaviour over other people's money to a larger extent than women. Our results indicate that women might be more risk-averse than men. In order to test the statistical validity of this finding, we look at the sub-samples on gender in both treatments using a Mann-Whitney two-sided U-test.
Table 8 presents the mean and standard deviation for the average amount of safe choices and CRRA estimates of both sexes in treatment "Others". It also give the Mann-Whitney z-values and corresponding two-tailed p-values for differences in amount of safe choices and CRRA estimates between men and women in treatment "Others". The gender distribution in "Others" was 21 male and 19 female.

Table 8 – Average safe choices and CRRA estimates for men and women in "Others"

	Treatment "Others" Men		Treatment "Others" Women		Mann-Whitney U-test	
Test variable	Mean	Std. dev.	Mean	Std. dev.	z-value	p-value
Safe choices	3.90	1.84	4.79	1.23	-2.01	0.05
CRRA	-1.71	0.68	-0.37	0.35	-1.54	0.12

According to the table men in treatment "Others" take significantly more risk than women in terms of safe choices. While the mean of men's safe choices is 3.90 with a standard deviation of 1.84, women's mean of safe choices is 4.79 with a standard deviation of 1.23. The Mann-Whitney two-sided U-test shows a significant gender difference at the $p < 0.05$ level for the amount of safe choices, but the gender difference is not significant for the CRRA estimates ($p<0.12$). Evidently, there is a week gender effect in the "Others" treatment. In treatment "Own" the difference was not statistically significant, supporting existing research (Chakravarty, et al., 2009; Harrison, et al., 2005; Harrison & Rutström, 2008)[25].

Several former laboratory studies conclude that women are more risk-averse than men (see e.g. Eckel & Grossman, 2008). If we assume the gender stereotype, which states that men are less emotional than women, this indicates a support for the absence of *Risk-as-feelings* within men. However, the mean of CRRA estimates used in the Mann-Whitney two-sided U-test is

[25] Results from the Mann-Whitney two-sided U-test in treatment "Own" are reported in appendix F.

adjusted for subjects who switched back and forth between safe and risky choices. Hence the CRRA coefficient is more reliable to affirm a possible gender effect and our conclusion is that gender effect is nonexistent.

5.3.5.2 Income effect

Following Chakravarty et al. (2009), the income level of parents do affect the people's risk attitudes. They find that subjects whose parents have a medium income level are more risk-averse than others (p-value = 0.05). To investigate this issue we divided the subjects into two groups; high income versus medium/low income. Our definition of high income is: total amount of gross (pre-tax) income earned in 2009 by the subjects' parents higher than NOK 1 000 000. There were a total of 22 subjects in the high income category. 46 subjects had medium/low-earning parents who earned less than NOK 1 000 000. We had 12 missing subjects who either did not know, or did not want to answer this question. Again we use a Mann-Whitney two-sided U-test to check for differences between the two sub-samples in table 9:

Table 9 – Average safe choices and CRRA estimates for high versus medium/low income

	High income		Medium/low income		Mann-Whitney U-test	
Test variable	Mean	Std. dev.	Mean	Std. dev.	z-value	p-value
Safe choices	5.00	1.16	4.46	1.59	-1.38	0.17
CRRA	0.26	0.32	0.04	0.56	-1.56	0.12

The Mann-Whitney two-sided U-test generates p-values>0.05 so we do not have statistical evidence of a high income effect.

6 Conclusion

Existing experimental literature on risk-taking have until recently focused on choices that only affects the decision-maker (see e.g. the survey in Harrison & Rutström, 2008). Assuming "normal" laboratory payoffs, people in general tend to be (slightly) risk-averse when making decisions under uncertainty. This is consistent with previous findings (Harrison, et al., 2005; Holt & Laury, 2002, 2005) and rejects the traditional risk-neutral prediction. But when payoffs are scaled up, people become sharply more risk-averse (Harrison, et al., 2005; Holt &

Laury, 2002, 2005). Surprisingly though, the literature is scant on the fundamental question of how people behave when taking risk on behalf of others. Our experiment is a contribution to this field.

We find that people in general tend to be significantly less risk-averse when making risky decisions over other people's money than over their own. Assuming that agents exhibit less feelings over their principals' money than over their own, our result supports the *Risk-as-feelings* hypothesis. This reaffirms the findings of Chakravarty et al. (2009) and contradicts the result of Eriksen and Kvaløy (2009). In order to compare in-sample responses, Chakravarty et al. (2009) let their subjects either make decisions over their own money first, and then over another person's money, or vice versa. Thus our findings serve as a robustness check because we let different people perform the tasks in the baseline and main experiment. Chakravarty et al. (2009)'s results are seemingly not confounded by an order effect.

There are several possible reasons why our result contradicts the result of Eriksen and Kvaløy (2009). They conducted a repeated game based on Gneezy and Potters' (1997) design, and find that people behave consistently with MLA over their clients' money and take less risk with their clients' money than with their own. In contrast to a repeated game, we replicated Chakravarty et al.'s (2009) study, which is a single played game. Therefore our responders did not have the opportunity to exhibit MLA. While Eriksen and Kvaløy (2009) conducted a fully computerized experiment, our subjects used pen and paper and threw the die themselves. This could possibly trigger an illusion of control (see e.g. Langer, 1975), making the subjects in "Others" less risk-averse on behalf of their clients. In addition, our design is based on EUT, while their design is based on PT. The different framing could also be a possible answer to the contradictory findings. Our design had a focal point between choice 4 and 5 in order to be risk-neutral and the risk-rate and lottery winnings were fixed, while in Eriksen and Kvaløy's (2009) experiment the risk-rate and amount of investments were set by the subjects themselves and a focal point was nonexistent. Their subjects could therefore experience loss aversion when loosing the invested money, which can trigger a higher degree of risk aversion in the subsequent decisions.

We found that gender had a significant effect on the number of safe choices in treatment "Others", but the effect was not significant in terms of CRRA. The mean of CRRA estimates used in the Mann-Whitney two-sided U-test was adjusted for subjects who switched back and forth between safe and risky choices. Hence we find the CRRA to be more reliable to affirm gender effect, and our conclusion is that the gender effect is nonexistent. We do not find any other significant demographic effects.

Further research should strive for a better understanding of what motivates agents acting on behalf of others. An experiment where the design makes it possible to measure the effect of non-monetary motivation such as other-regarding preferences is advisable. New findings may shed light on the importance of other-regarding preferences, and help mutual funds improve. Investment managers in mutual funds will then be able to identify their clients' risk preferences better and act in accordance with them. Another area of interest is to identify the reasons why individuals leave agents to make risky decisions on their behalf since our study and research shows that the agents' risk attitudes differ from the clients' risk attitudes (Chakravarty, et al., 2009; Eriksen & Kvaløy, 2009). It could also be interesting to conduct a field experiment in which the clients know the investment managers and compare the results with recent findings.

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Appendix

A – Instructions sessions A and C, baseline experiment "Own"

Welcome to this economic experiment

This is a study of economic decision making. You will be paid NOK 100 for your participation, but you will earn additional money. How much you will earn depend on the choices you make and chance. The instructions are simple and we ask you to pay close attention.

The problems are not designed to test you. What we want to know is what choices you make in them. The only right answer is what you really would choose. That is why the problems give you the chance of earning real money. You will be paid in cash today, at the end of the session.

The tasks will proceed in two short parts.

Part 1 is a decision problem in which chance plays a part. The first task requires you to make choices, and this is described in details in a moment. This part will result in additional earnings over the NOK 100 participation fee.

Part 2 consists of a few questions about you. This information is for research use only. The published results of our research will not identify you, or the choices you made in any way. In fact, we will only identify you on these sheets by a numeric ID, and that ID will not appear on the sheet that has your name for our payment records.

We expect the entire task to take approximately 45 minutes.

Please raise your hand if you have any questions during the session.

Part 1 Decision task

Your decision sheet shows ten decisions listed on the left. Each decision is a paired choice between “Option A” and “Option B.” You will make a choice on each row and record these in the right column. Your decisions will determine your payoffs from this decision task.

As we started the experiment you received an envelope with instructions in a random order. This ensures that the ID number that you have received, and that is listed in the top left corner of your decision sheet, was given to you randomly.

We will now perform the next task, where your decisions will determine how much you will earn in addition to the participation fee.

Here is a ten-sided die that will be used to determine payoffs. The faces are numbered from 0 to 9, and we will use the 0 face of the die to serve as 10. Look at Decision 1 at the top. Option A pays NOK 75 if the throw of the ten sided die is 1, and it pays NOK 60 if the throw is 2-10. Option B yields NOK 145 if the throw of the die is 1, and it pays NOK 4 if the throw is 2-10.

The other decisions are similar, except that as you move down the table, the chances of the higher payoff for each option increase. In fact, for Decision 10 in the bottom row, the die will not be needed since each option pays the highest payoff for sure, so your choice here is between NOK 75 or NOK145.

After you have made all of your choices, you will throw this die twice, once to select one of the ten decisions to be used, and a second time to determine what the payoff is for the option you chose, A or B, for the particular decision selected. Even though you will make ten decisions, only one of these will end up affecting your earnings, but you will not know in advance which decision will be used.

When you are finished, we will come around and let you perform the die throws.

Please fill in the decision sheets now. We kindly ask you not to talk to each other when you perform this task.

ID number: __________

Decision sheet

Decision	Option A	Option B	Your choice (circle A or B)
1	NOK 75 if throw of die is 1, NOK 60 if throw of die is 2-10	NOK 145 if throw of die is 1, NOK 4 if throw of die is 2-10	A B
2	NOK 75 if throw of die is 1-2, NOK 60 if throw of die is 3-10	NOK 145 if throw of die is 1-2, NOK 4 if throw of die is 3-10	A B
3	NOK 75 if throw of die is 1-3, NOK 60 if throw of die is 4-10	NOK 145 if throw of die is 1-3, NOK 4 if throw of die is 4-10	A B
4	NOK 75 if throw of die is 1-4, NOK 60 if throw of die is 5-10	NOK 145 if throw of die is 1-4, NOK 4 if throw of die is 5-10	A B
5	NOK 75 if throw of die is 1-5, NOK 60 if throw of die is 6-10	NOK 145 if throw of die is 1-5, NOK 4 if throw of die is 6-10	A B
6	NOK 75 if throw of die is 1-6, NOK 60 if throw of die is 7-10	NOK 145 if throw of die is 1-6, NOK 4 if throw of die is 7-10	A B
7	NOK 75 if throw of die is 1-7, NOK 60 if throw of die is 8-10	NOK 145 if throw of die is 1-7, NOK 4 if throw of die is 8-10	A B
8	NOK 75 if throw of die is 1-8, NOK 60 if throw of die is 9-10	NOK 145 if throw of die is 1-8, NOK 4 if throw of die is 9-10	A B
9	NOK 75 if throw of die is 1-9, NOK 60 if throw of die is 10	NOK 145 if throw of die is 1-9, NOK 4 if throw of die is 10	A B
10	NOK 75 if throw of die is 1-10	NOK 145 if throw of die is 1-10	A B

Decision row chosen by first throw of the die: __________

Throw of the die to determine payment: __________

Your earnings: __________ NOK

ID number: ______________

Part 2 Some questions about you

In this survey most of the questions asked are descriptive. We will not be grading your answers and your responses are completely confidential. Please think carefully about each question and give your best answers.

1. What is your age? _____________ years

2. What is your sex? (Circle one number.)

   01 Male
   02 Female

3. What was or is your undergraduate major? (Circle one number.)

   01 Health professions
   02 History and culture
   03 Hotel and tourism management
   04 Sports
   05 Engineering
   06 Teacher training
   07 Media
   08 Music and dance
   09 Scientific subjects
   10 Social science
   11 Language and literature
   12 Economics

4. If you are a graduate student, what is your class standing? (Circle one number.)

   01 First year Master's
   02 Second year Master's

5. What was the **highest** level of education that your **father** (or male guardian) completed? (Circle one number.)

   01 Upper secondary school or less
   02 Bachelor's degree or equivalent (1-3 years of higher education)
   03 Master's degree or equivalent (4-5 years of higher education)
   04 Doctor's degree

6. What was the **highest** level of education that your **mother** (or female guardian) completed? (Circle one number.)

    01 Upper secondary school or less
    02 Bachelor's degree or equivalent (1-3 years of higher education)
    03 Master's degree or equivalent (4-5 years of higher education)
    04 Doctor's degree

7. What is your marital status? (Circle one number.)

    01 Single
    02 Married
    03 Separated, divorced or widowed

8. What is your average grade at the University of Stavanger? (Circle one number.)

    01 A
    02 B
    03 C
    04 D
    05 E
    06 F

9. Please circle the category below that describes the total amount of gross (pre-tax) income earned in 2009 by your parents? (Circle one number.)

    01 Less than NOK 400 000
    02 Between NOK 400 000 and 599 000
    03 Between NOK 600 000 and 799 000
    04 Between NOK 800 000 and 999 000
    05 Above NOK 1 000 000
    06 Do not want to answer
    07 Do not know

10. Do you currently smoke cigarettes? (Circle one number.)

    01 Yes
    02 No

If yes, approximately how much do you smoke in one day? _______ cigarettes

Finalization

In today's experiment what you earn, in addition to what you have already earned, will be decided by choices made by a person in the other room, picked at random. The decisions made by this person are identical with those of part 1, but the earnings will go to you and not the person who made the choices.

When you are finished we kindly ask you to hand in the questionnaire and sign a receipt to receive the money you have earned in cash before you can leave the room.

Thank you for your participation!

RECEIPT

I verify that I have participated in an economic experiment on ___________________________
and received the following earnings in compensation:

Total: _____________ NOK

Name (block letters): ____

Date of birth (6 digits): ____

Signature: ____

B – Instructions sessions B and D, main experiment "Others"

Welcome to this economic experiment

This is a study of economic decision making. You will be paid NOK 100 for your participation. The instructions are simple and we ask you to pay close attention.

The problems are not designed to test you. What we want to know is what choices you make in them. The only right answer is what you really would choose. You will be paid in cash today, at the end of the session.

The tasks will proceed in two short parts.

Part 1 is a decision problem in which chance plays a part. The first task requires you to make choices, and this is described in details in a moment.

Part 2 consists of a few questions about you. This information is for research use only. The published results of our research will not identify you, or the choices you made in any way. In fact, we will only identify you on these sheets by a numeric ID, and that ID will not appear on the sheet that has your name for our payment records.

We expect the entire task to take approximately 30 minutes.

Please raise your hand if you have any questions during the session.

Part 1 Decision task

Your decision sheet shows ten decisions listed on the left. Each decision is a paired choice between "Option A" and "Option B." You will make a choice on each row and record these in the right column. Your decisions will determine the payoffs from this decision task to one person in the other room, picked at random. The person in the other room is not given a task at all. Apart from the participation fee of NOK 100, his or her earnings depend only on your decision.

As we started the experiment you received an envelope with instructions in a random order. This ensures that the ID number that you have received, and that is listed in the top left corner of your decision sheet, was given to you randomly. You will be matched with a randomly chosen person in the other room. We will not reveal to you who this person is, however, to guarantee that person's anonymity.

We will now perform the next task, where your decisions will determine the payoffs to one of the persons in the other room.

Here is a ten-sided die that will be used to determine payoffs. The faces are numbered from 0 to 9, and we will use the 0 face of the die to serve as 10. Look at Decision 1 at the top. Option A pays NOK 75 if the throw of the ten sided die is 1, and it pays NOK 60 if the throw is 2-10. Option B yields NOK 145 if the throw of the die is 1, and it pays NOK 4 if the throw is 2-10.

The other decisions are similar, except that as you move down the table, the chances of the higher payoff for each option increase. In fact, for Decision 10 in the bottom row, the die will not be needed since each option pays the highest payoff for sure, so your choice here is between NOK 75 or NOK145.

After you have made all of your choices, you will throw this die twice, once to select one of the ten decisions to be used, and a second time to determine what the payoff is for the option you chose, A or B, for the particular decision selected. Even though you will make ten decisions, only one of these will end up affecting the earnings of one of the persons in the other room, but you will not know in advance which decision will be used.

When you are finished, we will come around and let you perform the die throws.

Please fill in the decision sheets now. We kindly ask you not to talk to each other when you perform this task.

ID number: __________

Decision sheet

Decision	Option A	Option B	Your choice (circle A or B)
1	NOK 75 if throw of die is 1, NOK 60 if throw of die is 2-10	NOK 145 if throw of die is 1, NOK 4 if throw of die is 2-10	A B
2	NOK 75 if throw of die is 1-2, NOK 60 if throw of die is 3-10	NOK 145 if throw of die is 1-2, NOK 4 if throw of die is 3-10	A B
3	NOK 75 if throw of die is 1-3, NOK 60 if throw of die is 4-10	NOK 145 if throw of die is 1-3, NOK 4 if throw of die is 4-10	A B
4	NOK 75 if throw of die is 1-4, NOK 60 if throw of die is 5-10	NOK 145 if throw of die is 1-4, NOK 4 if throw of die is 5-10	A B
5	NOK 75 if throw of die is 1-5, NOK 60 if throw of die is 6-10	NOK 145 if throw of die is 1-5, NOK 4 if throw of die is 6-10	A B
6	NOK 75 if throw of die is 1-6, NOK 60 if throw of die is 7-10	NOK 145 if throw of die is 1-6, NOK 4 if throw of die is 7-10	A B
7	NOK 75 if throw of die is 1-7, NOK 60 if throw of die is 8-10	NOK 145 if throw of die is 1-7, NOK 4 if throw of die is 8-10	A B
8	NOK 75 if throw of die is 1-8, NOK 60 if throw of die is 9-10	NOK 145 if throw of die is 1-8, NOK 4 if throw of die is 9-10	A B
9	NOK 75 if throw of die is 1-9, NOK 60 if throw of die is 10	NOK 145 if throw of die is 1-9, NOK 4 if throw of die is 10	A B
10	NOK 75 if throw of die is 1-10	NOK 145 if throw of die is 1-10	A B

Decision row chosen by first throw of the die: __________

Throw of the die to determine payment: __________

Earnings: __________ NOK

ID number: _____________

Part 2 Some questions about you

In this survey most of the questions asked are descriptive. We will not be grading your answers and your responses are completely confidential. Please think carefully about each question and give your best answers.

When you are finished we kindly ask you to hand in the questionnaire and sign a receipt to receive the participation fee in cash before you can leave the room.

Thank you for your participation!

1. What is your age? _____________ years

2. What is your sex? (Circle one number.)

   01 Male
   02 Female

3. What was or is your undergraduate major? (Circle one number.)

   01 Health professions
   02 History and culture
   03 Hotel and tourism management
   04 Sports
   05 Engineering
   06 Teacher training
   07 Media
   08 Music and dance
   09 Scientific subjects
   10 Social science
   11 Language and literature
   12 Economics

4. If you are a graduate student, what is your class standing? (Circle one number.)

   01 First year Master's
   02 Second year Master's

5. What was the **highest** level of education that your **father** (or male guardian) completed? (Circle one number.)

   01 Upper secondary school or less
   02 Bachelor's degree or equivalent (1-3 years of higher education)
   03 Master's degree or equivalent (4-5 years of higher education)
   04 Doctor's degree

6. What was the **highest** level of education that your **mother** (or female guardian) completed? (Circle one number.)

   01 Upper secondary school or less
   02 Bachelor's degree or equivalent (1-3 years of higher education)
   03 Master's degree or equivalent (4-5 years of higher education)
   04 Doctor's degree

7. What is your marital status? (Circle one number.)

   01 Single
   02 Married
   03 Separated, divorced or widowed

8. What is your average grade at the University of Stavanger? (Circle one number.)

   01 A
   02 B
   03 C
   04 D
   05 E
   06 F

9. Please circle the category below that describes the total amount of gross (pre-tax) income earned in 2009 by your parents? (Circle one number.)

   01 Less than NOK 400 000
   02 Between NOK 400 000 and 599 000
   03 Between NOK 600 000 and 799 000
   04 Between NOK 800 000 and 999 000
   05 Above NOK 1 000 000
   06 Do not want to answer
   07 Do not know

10. Do you currently smoke cigarettes? (Circle one number.)

   01 Yes
   02 No

If yes, approximately how much do you smoke in one day? _______ cigarettes

RECEIPT

I verify that I have participated in an economic experiment on __________________________
and received the following earnings in compensation:

Total: ____________ NOK

Name (block letters): ____

Date of birth (6 digits): ____

Signature: ____

C – Lottery choices and payoffs

Session A – Baseline experiment ”Own”

Key: S = safe choice (lottery A)
R = risky choice (lottery B)

Safe choices	Decision	Risk preferance	Range of CRRA
0	RRRRRRRRRR	highly risk-loving	CRRA < -1.71
1	S / RRRRRRRRR		-1.71 < CRRA < -0.95
2	SS / RRRRRRRR	risk-loving	-0.95 < CRRA < -0.49
3	SSS / RRRRRRR	slightly risk-loving	-0.49 < CRRA < -0.15
4	SSSS / RRRRRR	risk-neutral	-0.15 < CRRA < 0.15
5	SSSSS / RRRRR	slightly risk-averse	0.15 < CRRA < 0.41
6	SSSSSS / RRRR	risk-averse	0.41 < CRRA < 0.68
7	SSSSSSS / RRR	very risk-averse	0.68 < CRRA < 0.97
8	SSSSSSSS / RR	highly risk-averse	0.97 < CRRA < 1.37
9	SSSSSSSSS / R	stay in bed	CRRA > 1.37

Subject	Safe choices	Decision	Payoff (NOK)
A1	6	SSSSSS / RRRR	60
A2	5	SSSSS / RRRRR	60
A3	5	SSSSS / RRRRR	60
A4	6	SSSSSS / RRRR	60
A5	5	RSRSRSS / RRS	145
A6	6	SSSSSS / RRRR	75
A7	4	SSSS / RRRRRR	145
A8	6	SSSSSS / RRRR	145
A9	6	SSSSSS / RRRR	4
A10	7	SSSSSSS / RRR	145
A11	5	SSSSS / RRRRR	145
A12	7	SSSSSRS / RRR	145
A13	5	SSSSS / RRRRR	145
A14	7	SSSSSSS / RRR	75
A15	4	SRSRSS / RRRR	145

Session B – Main experiment "Others"

Key: S = safe choice (lottery A)
R = risky choice (lottery B)

Safe choices	Decision	Risk preferance	Range of CRRA
0	RRRRRRRRRR	highly risk-loving	CRRA < -1.71
1	S / RRRRRRRRR		-1.71 < CRRA < -0.95
2	SS / RRRRRRRR	risk-loving	-0.95 < CRRA < -0.49
3	SSS / RRRRRRR	slightly risk-loving	-0.49 < CRRA < -0.15
4	SSSS / RRRRRR	risk-neutral	-0.15 < CRRA < 0.15
5	SSSSS / RRRRR	slightly risk-averse	0.15 < CRRA < 0.41
6	SSSSSS / RRRR	risk-averse	0.41 < CRRA < 0.68
7	SSSSSSS / RRR	very risk-averse	0.68 < CRRA < 0.97
8	SSSSSSSS / RR	highly risk-averse	0.97 < CRRA < 1.37
9	SSSSSSSSS / R	stay in bed	CRRA > 1.37

Subject	Safe choices	Decision	Payoff (NOK)
B1	4	SSSS / RRRRRR	145
B2	6	SSSSSS / RRRR	4
B3	3	SRSRRS / RRRR	4
B4	6	SSSSSS / RRRR	145
B5	4	SSSS / RRRRRR	60
B6	4	RRRRRSSSS / R	75
B7	6	SSSSSS / RRRR	75
B8	3	SSS / RRRRRRR	145
B9	5	SSSSS / RRRRR	145
B10	6	SSSSSS / RRRR	60
B11	4	SSSS / RRRRRR	145
B12	5	SSSSS / RRRRR	60
B13	7	SSSSSSS / RRR	145
B14	5	SSSSS / RRRRR	145
B15	4	SSSS / RRRRRR	4

Session C – Baseline experiment ”Own”

Key: S = safe choice (lottery A)
R = risky choice (lottery B)

Safe choices	Decision	Risk preferance	Range of CRRA
0	RRRRRRRRRR	highly risk-loving	CRRA < -1.71
1	S / RRRRRRRRR		-1.71 < CRRA < -0.95
2	SS / RRRRRRRR	risk-loving	-0.95 < CRRA < -0.49
3	SSS / RRRRRRR	slightly risk-loving	-0.49 < CRRA < -0.15
4	SSSS / RRRRRR	risk-neutral	-0.15 < CRRA < 0.15
5	SSSSS / RRRRR	slightly risk-averse	0.15 < CRRA < 0.41
6	SSSSSS / RRRR	risk-averse	0.41 < CRRA < 0.68
7	SSSSSSS / RRR	very risk-averse	0.68 < CRRA < 0.97
8	SSSSSSSS / RR	highly risk-averse	0.97 < CRRA < 1.37
9	SSSSSSSSS / R	stay in bed	CRRA > 1.37

Subject	Safe choices	Decision	Payoff (NOK)
C1	5	SSSSS / RRRRR	75
C2	3	SSS / RRRRRRR	60
C3	7	SSSSSSS / RRR	75
C4	5	SSSRS / RRRRR	145
C5	4	SRRSSRRS / RR	145
C6	5	SSSSS / RRRRR	4
C7	4	SSSS / RRRRRR	60
C8	6	SSSSSS / RRRR	75
C9	4	SSSS / RRRRRR	145
C10	6	SSSSSS / RRRR	145
C11	6	SSSSSS / RRRR	75
C12	5	SSSSS / RRRRR	145
C13	5	SSSSS / RRRRR	145
C14	5	SSSSS / RRRRR	75
C15	4	SSSS / RRRRRR	60
C16	4	SSSS / RRRRRR	145
C17	5	SSSSS / RRRRR	145
C18	6	SSSSSS / RRRR	145
C19	5	SSSSRS / RRRR	60
C20	6	SSSSSS / RRRR	60
C21	2	SS / RRRRRRRR	145
C22	6	SSSSSS / RRRR	60
C23	4	SSSS / RRRRRR	60
C24	5	SSSSS / RRRRR	145
C25	7	SSSSSSS / RRR	75

Session D – Main experiment ”Others”

Key: S = safe choice (lottery A)
R = risky choice (lottery B)

Safe choices	Decision	Risk preferance	Range of CRRA
0	RRRRRRRRRR	highly risk-loving	CRRA < -1.71
1	S / RRRRRRRRR		-1.71 < CRRA < -0.95
2	SS / RRRRRRRR	risk-loving	-0.95 < CRRA < -0.49
3	SSS / RRRRRRR	slightly risk-loving	-0.49 < CRRA < -0.15
4	SSSS / RRRRRR	risk-neutral	-0.15 < CRRA < 0.15
5	SSSSS / RRRRR	slightly risk-averse	0.15 < CRRA < 0.41
6	SSSSSS / RRRR	risk-averse	0.41 < CRRA < 0.68
7	SSSSSSS / RRR	very risk-averse	0.68 < CRRA < 0.97
8	SSSSSSSS / RR	highly risk-averse	0.97 < CRRA < 1.37
9	SSSSSSSSS / R	stay in bed	CRRA > 1.37

Subject	Safe choices	Decision	Payoff (NOK)
D1	3	SSRRRSR / RRR	145
D2	5	SSSSS / RRRRR	145
D3	0	RRRRRRRRRR	145
D4	3	SSS / RRRRRRR	60
D5	5	RRSRSSSRS / R	60
D6	5	SSSSS / RRRRR	145
D7	1	RS / RRRRRRRR	4
D8	5	SSSSS / RRRRR	60
D9	4	SSSS / RRRRRR	4
D10	3	SSS / RRRRRRR	145
D11	2	SS / RRRRRRRR	145
D12	6	SSSRSSRS / RR	75
D13	4	SSSS / RRRRRR	75
D14	3	SSS / RRRRRRR	145
D15	4	SSSS / RRRRRR	145
D16	4	SSSS / RRRRRR	60
D17	4	SSSS / RRRRRR	145
D18	4	SSSS / RRRRRR	60
D19	4	SSSS / RRRRRR	145
D20	4	SSSS / RRRRRR	75
D21	3	RSRRSRS / RRR	145
D22	4	SSSRS / RRRRR	60
D23	7	SSSSSRSS / RR	75
D24	5	SSSSS / RRRRR	145
D25	9	SR / SSSSSSSS	60

D – Demographic data

Demographic data codes

In the following tables, the subject number is on the left, and the demographic data codes are:

(A) Age: What is your age?
(B) Gender: What is your sex? 0 = male, 1 = female
(C) Field of study: What was or is your undergraduate major? 1 = health professions, 2 = history and culture, 3 = hotel and tourism management, 4 = sports, 5 = engineering, 6 = teacher training, 7 = media, 8 = music and dance, 9 = scientific subjects, 10 = social science, 11 = language and literature, 12 = economics
(D) Class standing: What is your class standing? 1 = bachelor, 2 = 1st year master's, 3 = 2nd year master's
(E) Father's education: What was the highest level of education that your father (or male guardian) completed? 1 = upper secondary school or less, 2 = bachelor's degree or equivalent (1-3 years of higher education), 3 = master's degree or equivalent (4-5 years of higher education), 4 = doctor's degree
(F) Mother's education: What was the highest level of education that your mother (or female guardian) completed? 1 = upper secondary school or less, 2 = bachelor's degree or equivalent (1-3 years of higher education), 3 = master's degree or equivalent (4-5 years of higher education), 4 = doctor's degree
(G) Marital status: What is your marital status? 0 = single, 1 = married
(H) Average grade: What is your average grade at the University of Stavanger? 1 = A, 2 = B, 3 = C, 4 = D, 5 = E, 6 = F
Parents' earnings: Please circle the category below that describes the total amount of gross (pre-tax) income earned in 2009 by your parents? 1 = less than NOK 400 000, 2 = between NOK 400 000 and 599 000, 3 = between NOK 600 000 and 799 000, 4 = between NOK 800 000 and 999 000, 5 = above NOK 1 000 000, 6 = do not want to answer, 7 = do not know
(I) Parents' earnings: Please circle the category below that describes the total amount of gross (pre-tax) income earned in 2009 by your parents? 1 = less than NOK 400 000, 2 = between NOK 400 000 and 599 000, 3 = between NOK 600 000 and 799 000, 4 = between NOK 800 000 and 999 000, 5 = above NOK 1 000 000, 6 = do not want to answer, 7 = do not know
(J) Smoker: Do you currently smoke cigarettes? 0 = no, 1 = yes

Demographic data for sessions A and B

Column key: Age (A), gender (B), field of study (C), class standing (D), father's education (E), mother's education (F), marital status (G), average grade (H), parents' earnings (I), smoker (J). See data codes on previous page.

Subject ID	A	B	C	D	E	F	G	H	I	J
A1	23	0	6	1	1	2	0	3	5	0
A2	21	1	1	1	2	1	0	4	2	0
A3	32	0	3	3	2	1	0	3	1	1
A4	22	1	6	1	1	3	0	2	3	0
A5	33	1	11	1	1	1	0	2	2	0
A6	23	0	5	2	3	2	0	4	5	0
A7	20	1	10	1	1	1	0	2	4	0
A8	24	1	12	3	3	3	0	2	5	0
A9	22	0	6	1	3	3	0	2	5	0
A10	21	1	10	1	2	2	0	2	5	0
A11	29	1	-	1	2	1	0	3	-	0
A12	22	1	10	1	1	2	0	3	-	0
A13	22	1	6	1	2	3	0	2	5	0
A14	23	0	5	2	3	1	0	3	-	0
A15	23	0	6	1	2	3	0	3	3	1
B1	20	1	6	1	1	1	0	2	3	0
B2	26	1	6	1	3	3	0	3	-	0
B3	25	0	2	3	1	1	0	1	2	0
B4	24	0	7	1	3	3	0	3	-	0
B5	23	0	9	1	3	2	0	3	3	0
B6	23	1	12	3	3	1	0	2	-	0
B7	22	1	4	1	3	2	0	3	-	0
B8	24	1	6	1	2	3	1	1	2	0
B9	35	1	12	1	1	1	0	3	3	0
B10	25	1	12	3	2	2	0	2	-	0
B11	26	1	3	3	1	1	1	2	5	0
B12	22	1	5	1	1	1	0	3	4	0
B13	22	1	5	1	2	1	0	3	3	0
B14	29	0	5	1	1	2	0	4	1	0
B15	29	0	12	3	3	3	0	1	5	0

Demographic data for session C

Column key: Age (A), gender (B), field of study (C), class standing (D), father's education (E), mother's education (F), marital status (G), average grade (H), parents' earnings (I), smoker (J). See data codes on previous page.

Subject ID	A	B	C	D	E	F	G	H	I	J
C1	25	0	5	3	3	2	0	2	3	0
C2	32	0	5	1	1	2	0	1	1	0
C3	21	1	8	1	4	2	0	2	5	0
C4	28	1	6	2	2	3	0	2	-	0
C5	27	0	5	3	3	2	0	3	2	0
C6	26	1	12	3	2	2	0	-	5	0
C7	24	0	5	1	2	1	0	4	2	1
C8	25	0	6	1	2	1	0	2	-	1
C9	25	0	12	3	2	2	0	2	5	0
C10	30	1	10	3	1	2	0	2	5	0
C11	32	1	12	1	3	3	1	3	-	0
C12	24	0	5	1	2	1	0	2	4	0
C13	20	0	5	1	1	2	0	3	3	0
C14	23	0	12	1	2	1	0	3	3	0
C15	23	0	5	1	3	2	0	3	3	0
C16	23	1	5	1	1	2	0	3	4	0
C17	25	0	7	1	2	2	0	3	4	0
C18	27	0	5	2	1	3	0	2	4	1
C19	22	0	5	1	2	4	0	3	5	0
C20	27	0	9	1	3	1	0	2	5	0
C21	25	0	5	2	2	2	0	2	3	0
C22	23	1	3	1	2	3	0	3	3	0
C23	20	1	11	1	3	3	0	4	5	1
C24	23	1	5	2	1	1	0	3	3	0
C25	23	0	5	1	1	2	0	2	4	0

Demographic data for session D

Column key: Age (A), gender (B), field of study (C), class standing (D), father's education (E), mother's education (F), marital status (G), average grade (H), parents' earnings (I), smoker (J). See data codes on previous page.

Subject ID	A	B	C	D	E	F	G	H	I	J
D1	21	1	3	1	1	2	0	2	-	1
D2	23	1	12	1	1	1	0	2	2	0
D3	23	0	5	1	4	4	0	2	4	0
D4	48	0	1	1	3	1	1	2	1	0
D5	34	1	10	3	2	1	0	2	4	0
D6	24	1	12	3	3	2	0	2	5	0
D7	20	0	1	1	2	1	0	3	2	0
D8	24	1	12	2	1	1	0	2	3	0
D9	24	0	12	3	1	3	0	2	3	0
D10	21	0	5	1	2	2	0	2	5	0
D11	23	0	5	2	3	2	0	1	4	0
D12	25	0	5	1	1	1	0	3	4	0
D13	22	0	5	1	2	2	0	4	5	0
D14	24	0	5	1	1	2	0	3	4	0
D15	26	0	5	1	2	2	0	3	4	0
D16	20	1	7	1	2	3	0	2	3	0
D17	25	0	5	2	3	1	0	1	5	0
D18	23	0	5	1	1	1	0	4	2	0
D19	26	0	5	1	2	2	0	3	5	0
D20	22	0	5	2	2	2	0	3	5	0
D21	50	1	1	1	1	1	1	3	1	0
D22	21	1	11	1	2	1	0	4	5	0
D23	21	1	11	1	1	1	0	4	2	0
D24	24	0	5	2	1	1	0	3	3	0
D25	20	0	5	1	2	1	0	2	2	0

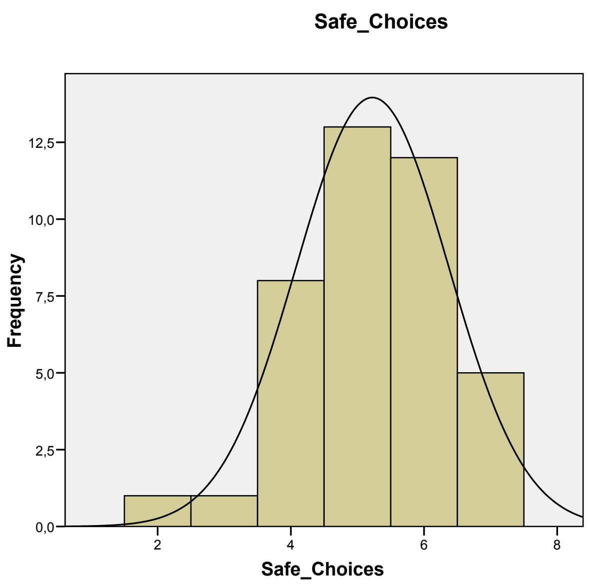
E – Descriptive statistics

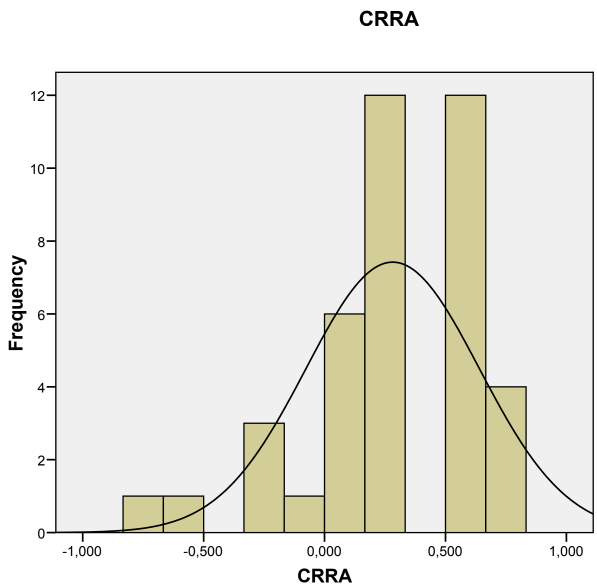
Here are the descriptive statistics from the baseline experiment "Own" and the main experiment "Others". For demographic data codes, see appendix D.

Baseline experiment "Own"

Variable	N	Min	Max	Mean	Std. dev.
Safe choices	40	2	7	5.23	1.14
CRRA	40	-0.72	0.83	0.28	0.36
Age	40	20	33	24.58	3.50
Class standing	40	1	3	1.50	0.78
Father's education	40	1	4	2	0.82
Mother's education	40	1	4	2	0.82
Grade	39	1	4	2.59	0.72
Parent's earnings	34	1	5	3.71	1.27

Histograms of safe choices and CRRA with normal distribution curve

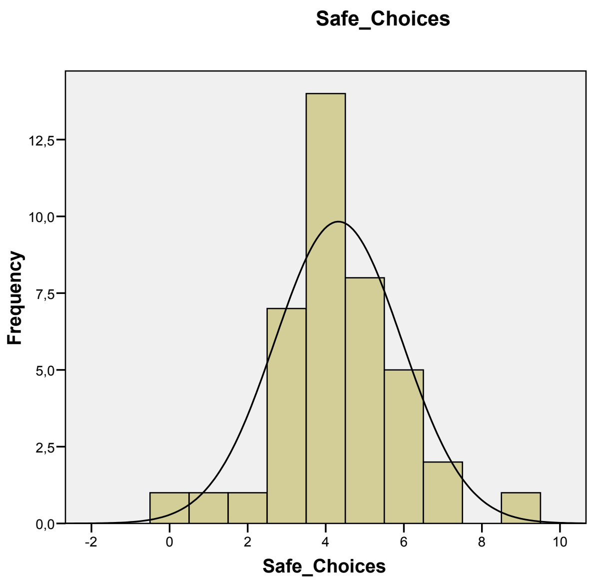


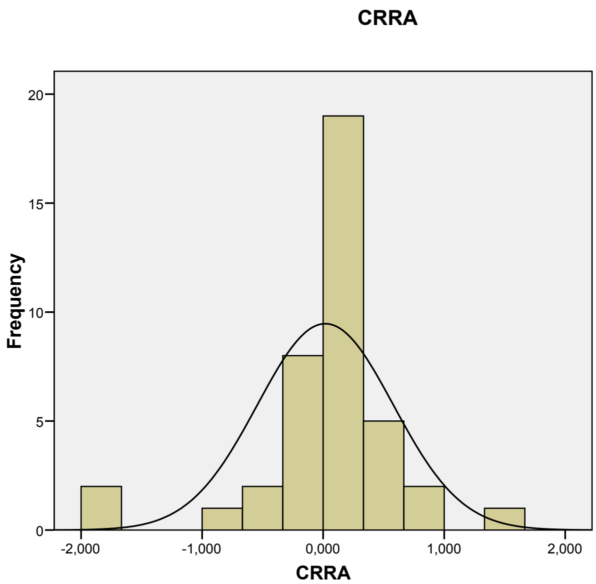


Main experiment "Others"

	N	Min	Max	Mean	Std. dev.
Safe choices	40	0	9	4.33	1.62
CRRA	40	-1.71	1.37	0.02	0.56
Age	40	20	50	25.23	6.42
Class standing	40	1	3	1.53	0.82
Father's education	40	1	4	1.90	0.87
Mother's education	40	1	4	1.70	0.82
Grade	40	1	4	2.5	0.88
Parent's earnings	34	1	5	3.35	1.32

Histograms of safe choices and CRRA with normal distribution curve





F – Average safe choices and CRRA estimates for men and women in “Own”

	Treatment “Own” Men		Treatment “Own” Women		Mann-Whitney U-test	
Test variable	Mean	Std. dev.	Mean	Std. dev.	z-value	p-value
Safe choices	5.05	1.25	5.44	0.98	-0.87	0.38
CRRA	0.23	0.40	0.34	0.30	-0.78	0.44