EMOTIONS, MOOD AND DECISION MAKING

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ABSTRACT:

Decisions are made according to a complex cognitive and emotional evaluation of the situation. The aim of the paper is to examine the effect of mood on risky investment decision making by using a mood induction procedure. The paper investigates how happy and sad mood affects risky investment decision making and whether there is a difference between the perception of fix investments and monetary investments. The analysis has been conducted focusing on individual investment decisions. Data for the research comes from a laboratory experiment, where 166 participants in happy, sad and neutral mood, filled out a questionnaire of investment decisions. The results indicate that mood does affect investment decision making, and positive and negative mood might have similar effect on the investment decision.

Key words: behavioural economics, experimental economics, experiment, decision making, emotions, mood, investment.

INTRODUCTION:

Human beings do not behave in a perfectly rational cognitive way, mostly because our behaviour is influenced by psychological and emotional factors. This is also why behavioural economics researches these topics, which are relevant in the decision making process.

The contemporary economics has more and more subfields which connects economics with other social or even biological sciences. Accordingly, decision making is researched as a field connected to psychology, sociology, neuroscience etc. Neuroscience and economics has produced a new subfield of research, known as neuroeconomics, which investigates through neuroscientific methods phenomena in the brain triggered by economics related cognitive processes.

The paper investigates how emotions and mood influence decision making. The paper describes the role and importance of emotions in the decision making process by presenting research findings from behavioural economics and neuroeconomics based on literature review. The selected literature explains how decision making related cognitive processes involve emotions, which in turn will influence decision making itself.

Until recently the role of psychological factors in decision making have not been seriously studied by economists. Even after the appearance of the first well aimed psychology deliberations, which suggested that psychological factors may be more important in economic decision making than it has been acknowledged, economists were reluctant to incorporate into their research the role of psychological factors. It is only now, after the emergence and publications of hard neuroscientific data, that the role of emotions is being more and more acknowledged in the economic decision making process.

In the last few decades an important and continuously developing subfield of economics started to have a large research support. This subfield of economics is the experimental economics. Traditionally the only source of empirical data was the field data,
coming from naturally occurring economic processes, which had major limitations. Experimental economics is able to produce new sources of data, which cannot be found on the field, and which makes it possible to test theory under controlled conditions in an artificial environment. Experimental economics has the necessary methods and tools to make it possible to test the effect of different emotions and mood on people’s decisions and risk perception.

Current research in behavioural economics is able to explain better and better the effects and influences of specific and particular emotions on economic and investment decision making. There is still much to study, especially how mixed emotions, and how different moods can change investment decisions. This paper provides research findings on the matter how different moods influence decision making, and people’s willingness to invest. A laboratory experiment was run to test the effect of mood on investment decision making.

The aim of the paper is to present how positive (happy), negative (sad) mood, compared to a neutral mood, affects investment decision making, by using a mood induction procedure.

The finding of the paper is that investment decisions made under happy or sad mood differ from decisions made under a neutral mood.

1. Literature Review

According to Rabin (1998), “because psychology systematically explores human judgment, behavior, and well-being, it can teach us important facts about how humans differ from the way they are traditionally described by economists.” (p. 11) According to Kahneman (2003), economists often criticize the research of psychologists because of their biases and errors, even though the economical rational agent models are psychologically unrealistic.

Rick & Loewenstein (2008) define behavioural economics as “a subdiscipline of economics that incorporates more psychologically realistic assumptions to increase the explanatory and predictive power of economic theory. The field first achieved prominence in the 1980s and has been gaining influence since then.” (p. 139)

Bechara et al. (2006) discusses that economics started to focus more on the forms of decision making, which go beyond the cost-benefit analysis. Recently, neuroscientists started to research decision making by applying different methods, such as the lesion method, functional imaging, and other psychological techniques. These new neuroscientific findings helped economics to realize that “decision making involves not only the cold-hearted calculation of expected utility based upon explicit knowledge of outcomes but also more subtle and sometimes covert processes that depend critically upon emotion.” (Bechara et al., 2006, pp. 260)

According to Phelps (2009), the field of neuroeconomics, which links the economic decision making to brain function, shows that emotions are present and have a role in decision making. There is a growing interest, among current economics researchers, in the role of emotions in decision making. Most of neuroeconomics studies have focused on emotions as a single variable, failing in capturing the complexity of emotions and their range of effect in decision making. (Phelps, 2009; Rustichini et al., 2005)

Economics is a social science and in the last decades there have been more and more evidences that subjectivity and psychological factors need to be incorporated into economic research. Gilboa (2009) says that objectivity can be seen as intersubjectivity, or close to this view, subjective probabilities, which coincide, are named objective.
The types of emotions, according to Elster (1998), are: social emotions (anger, pride, shame, guilt etc.), counterfactual emotions generated by thoughts about what might have happened but did not (disappointment, regret etc.), emotions generated by thoughts about what may happen (hope, fear), emotions generated by good or bad things that happened in the past (joy, grief), emotions arisen by the thought of others’ possessions (jealousy, envy) and emotions, which are not part of any of these categories (disgust, romantic love etc.). According to Hirshleifer & Shumway (2003), psychology literature is preoccupied with the way how emotions and moods influence decision making. People in good mood are capable of more unusual associations, are better in creative problem-solving, and have higher mental flexibility. Emotions influence their assessment of future prospects and risks, which both are very important tasks in investment decision making. They have found a correlation between sunshine and behaviour. On days with sunshine, people feel better, they feel more optimistic. People, however, may have the impression that their good mood and optimism is due to positive economic prospects. Consequently, on sunny days people are more willing to buy stocks. (Hirshleifer & Shumway, 2003) They research the effect of good mood on investment decision making, using sunny days, which induce good mood. It would be useful, however, to study the effect of bad mood as well. In the same time, for more accurate results, a mood assessment should also be done, to check the mood changes on sunny days compared to other days.

Gilboa (2010) underlines the importance of emotions in economic decision making. Emotionality could be viewed as the opposite of rationality, for instance, when people make irresponsible decisions as a result of emotional reactions, and then they regret it. Many emotions, however, do not take over the behaviour; they actually can be determinants of the utility. (Gilboa, 2010)

According to Loewenstein et al. (2001), feelings can arise without cognitive mediation and the impact of cognitive evaluation on behaviour is influenced by the feelings, which arise from the cognitive evaluation. The fact, that feelings do not need to be cognitively mediated, comes from the notion that feelings can arise from a risky stimulus directly, except for the basic perception of the information. (Loewenstein et al., 2001)

According to Bechara et al. (2006), one of the most important neuroscientific findings in decision making was the somatic-marker hypothesis, which refers to the fact that emotions play an important role in financial, personal and moral decision making, especially when uncertainty is present in the possible outcomes.

According to Livet (2010), emotions are raised from peoples’ comparison between two possible outcomes and from the compared outcomes as well. Regret is the emotion raised from the difference between the outcome and expected outcome as a result of making the choice. Disappointment is the emotion raised from the difference between the outcome and expected outcome as a result of chance. (Livet, 2010)

Grecucci et al. (2013) study the emotions in decision making while subjects are playing the Ultimatum Game (UG). By manipulating the emotional state of subjects, the UG decision making can be significantly changed, which proves the fact that even subtle incidental emotions play an important role in the decision making process. (Grecucci et al., 2013) According to Phelps (2009), it is considered an anomaly, from economic point of view, the decision of the subject to reject a positive, but small offer, when the alternative is that he receives nothing. The general explanation is that the subject is willing to pay a cost in order to punish the unfair offerer, who will receive also nothing. This altruistic punishment is thought to play a role in maintaining social norms. (Phelps, 2009)

According to Miu & Crisan (2011), emotions are involved in the framing effect in decision making. Framing effect is a bias in the decision making, where decisions change
according to the description of the same outcomes as gains or losses. The cause of this bias may be due to emotional influence. (Miu & Crisan, 2011)

Shiv et al. (2005) investigate, from the perspective of neuroscience, people’s investment decision based on emotional influence. The historical view is that emotions have a negative influence on behaviour, but according to researchers in neuroscience and psychology, emotions produce also positive effects on decision making. People with normal emotional processes do better in gambling games than people with emotional dysfunction. Depending on the type of the emotion, it can have good or bad influence on the decision. (Shiv et al., 2005)

According to neuroeconomic findings, decision making processes involve multiple systems in the brain. Sanfey et al. (2009) research dual-system accounts, such as: (i) the deliberative and cognitive system related processes, (ii) the automatic and affective behaviour related processes, and (iii) the emotional and the cognitive systems. (Sanfey et al., 2009) Redish et al. (2012) examine decision making systems in the brain, focusing on information processing.

There is much research done on the effect of emotions in the decision making process. Usually the effect of a specific emotion, such as anger, regret, guilt etc., is studied. In reality, however, in the decision making process a whole mixture of emotions are involved, producing a general state, which affects the mood of the individual. For obvious reasons, besides understanding the effect of particular emotions on decision making, there is a need to study the overall effect of moods on the investment decision making process.

2. Theoretical Background

Earlier, economics was declared as a non-experimental science. The essence of scientific experiments, according to Chakravarty et al. (2011), is the manipulative control over the environment in which phenomena of interest take place. Economics as a discipline was declared non-experimental because the crucial variables in the extant theory were judged to be uncontrollable. Experimental methods developed to generate substantive empirical propositions. They say that mainstream economics started to became receptive to experimental methods around 1980 and then experimental economics started to grow exponentially. (Chakravarty et al., 2011; Chakravarty, 2012; Roth, 1995; Samuelson, 2005)

Data can be drawn from several sources for empirical work. According to Friedman & Sunder (1994), experimental data are deliberately created under controlled conditions, and happenstance data are a by-product of ongoing uncontrolled processes. They distinguish laboratory data from field data. Laboratory data are gathered in an artificial environment and field data are gathered in a naturally occurring environment. (Friedman & Sunder, 1994)

According to Croson (2005) and Loewenstein (1999) there are many substantive and methodological similarities between experimental economics and psychological research, but there are some differences as well. Both fields are researching similar substantive areas, such as bargaining, negotiation, public goods provision, social dilemmas etc. The objective of the two fields often differs; economics experiments address economic theories and psychological experiments address psychological theories. (Croson, 2005) This difference in the objective, according to Croson (2005), is reflected in the methodological areas of economics experiments and psychology experiments. Croson (2005) discusses few methodological differences, such as incentives, context, subject pools, deception, experimental details and data analysis.
According to Creswell (2011), a scientific research has to be designed and written in one of the two major tracks: quantitative or qualitative research. The researcher either chooses one of the research designs or a combined research design based on the nature of the research problem and the research questions and hypothesis. (Creswell, 2011) According to Bryman (2006), “quantitative and qualitative research can be combined at different stages of the research process: formulation of research questions; sampling; data collection; and data analysis” (p. 101)

The experimental designs are the within subjects design and the between subjects design. In a between subjects analysis the behaviour of different subjects in two different settings are compared. In a within subjects analysis what is examined is the behaviour of a single subject making choices and decisions in two or more settings. (Camerer, 1995; Charness et al., 2012)

An experiment, according to Russel (2010), has an independent variable (IV) and a dependent variable (DV). The researcher creates different conditions for the IV to manipulate it and then measures the changes in the DV. Controls help to increase the experiments validity by ensuring that changes in the IV are the only effects on DV. (Russel, 2010)

Financial incentives are used by economists and deception is used by psychologists. Psychologists use deception to produce situations of special interest that are unlikely to arise otherwise. Economists disagree with the use of deception in experiments, because they may not be incentive compatible. Economic theories describe and predict decisions which are made by individuals in the presence of payoffs. Rewards are essential and self-evident precept for economist but not for psychologists who are more casual about defining subjects’ incentives. (Camerer, 1995; Chakravarty et al., 2011; Croson, 2005; Hertwig & Ortmann, 2003; Loewenstein, 1999; Rubinstein, 2001)

Social psychology involves experimental manipulations. Thus, the methodology of inducing emotions distinguishes social psychological methods from other methods. The most common mood induction procedures are the writing tasks, when participants have to write about an episode in their lives, for example. Another common mood induction procedure is when participants are listening to mood congruent music. Mood induction procedures can be used individually or combined. (Albarracin & Hart, 2011; Chepenik and Cornew, 2007; de l’Etoile, 2002; Harmon-Jones et al., 2007; Thaut & de l’Etoile, 1993)

3. Laboratory Experiment Investigating the Effect of Mood on Investment Decision Making

Design:
There are two treatment groups with happy and sad mood induction and a control group with neutral mood. One group’s behaviour is compared with the other groups’ behaviour, which is a between subjects design. In two questions it is used a within subjects design to see whether there is a difference in behaviour for the same group for a specific reason. The independent variable is the experimental manipulation and it is independent of all sources of variation except the one that is manipulated. Participants were not informed about the purpose of the mood induction procedure, so they did not know that there is a mood induction taking place, they just followed the instructions. This way the participant’s awareness bias was avoided. The dependent variables are psychological measures (visual analogue scale), self reports and the decision tasks which can be used to collect information about the effect of emotions and the mood induction. The independent variable in this experiment is the mood induction and the dependent variables are the decision tasks.
Participants:

A request for running the experiment with an ethical statement was lodged and accepted. The experiment was conducted in classes at Bolyai Farkas Theoretical High School in Targu Mures, Romania. The participants are high school students, young people who are about to become independent and soon start making important investment decisions for their future. Since the participants are all about 18 years old, the history effect was under control. The participants have not experienced yet mortgage, they have not made any real investment decisions yet, therefore their past experiences cannot influence their behaviour.

6 classes were randomly chosen from 18 classes, where (9 classes of 11th grade and 9 classes of 12th grade). The 6 classes were randomly distributed in three groups, two treatment groups and one control group.

Subjects were motivated by a tangible present (cereal bar and other sweets). These presents were given in order to motivate subjects to make the necessary cognitive effort and seriousness during experiment. Students agreed to participate in the experiment knowing that they will get some small present at the end, but without knowing what it was. School policy did not permit monetary payments.

A total of 166 people were involved in the experiment, so that every person participated only ones in exactly 1 of the 3 groups. The three groups consisted of 55 men and 111 women, and the mean of the participants’ age of 18.072 years (SD = 0.75, SE = 0.058, range = 17-19). The Control group consisted of 58 students (22 men and 36 women), the Positive treatment group consisted of 56 students (16 men and 40 women) and the Negative treatment group consisted of 52 students (17 men and 35 women).

Procedure:

It was used the ‘independent groups design’, which according to Russel (2010) has the following strengths: there are no order effects on the IV; participants see the experimental task once, which reduces the demand characteristics; and the effects of individual differences are reduced by the random allocation to groups. Russel (2010) names a few weaknesses of the ‘independent groups design’, such as: (i) individual differences may distort the results if participants differ across groups; (ii) more participants are needed than in the case of ‘repeated measures design’, which may be hard to find.

All the sessions were run manually. In total six sessions were run, two sessions for each of the three groups. The three groups were divided in two treatment groups and a control group. The first treatment group (TP) was induced in a positive, happy mood, and the second treatment group (TN) was induced in a negative, sad mood. The control group (C) had maintained their neutral mood, and a neutral mood induction procedure was used. All three groups performed the same mood induction method, only with different emotion valences. It was important for the control group to undergo the mood induction procedure, in order to be able to control the effect of filling out a questionnaire, before starting the decision making tasks. In this case all three groups, the two treatment groups and the control group were performing the same tasks and steps in the experiment. All participants were tested under only one mood induction (positive, negative or neutral).

The questionnaires contain hypothetical questions about investment decision making. The subjects are asked to imagine what decision they would make in that particular situation, and answer the questions as if they were real choices. According to Kahneman & Tversky (1979), the hypothetical choices method “emerges as the simplest procedure by which a large number of theoretical questions can be investigated. The use of the method relies on the
assumption that people often know how they would behave in actual situations of choice.” (p.265)

**Experiment program:**

It was handed out a registration form and an instruction sheet to the students in the classes. All materials were in the students’ native language, so there could be no language related difficulties.

Deception is not used in the experiment, and subjects were not misled. They were told that the experiment is in the field of decision making, but subjects were not told what the purpose of the study and the experiment was.

The first part of the experiment session was the mood induction procedure, where participants had to fill out a mood induction questionnaire specific for their group (positive, neutral and negative) to induce the desired mood, while a mood congruent music was played in the background, for each group, while participants were filling out the first questionnaire. The three different groups had three different questionnaires and three different kinds of mood congruent background music was played. Each participant had exactly the same mood induction questionnaire within each group. After participants completed the mood induction procedure, which took about 7-8 minutes, their mood change was measured by visual analogue scale (VAS). For mood assessment Chepenik & Cornew (2007) suggest the visual analogue scale (VAS), which consist of a 10 cm line with the words ‘better’ and ‘worst’ printed at opposite ends, with a small line bisecting the middle of the line. The small middle line represents the reference level, which is the participants’ mood before beginning the experiment. (Chepenik & Cornew, 2007) All VAS mood ratings are measured in millimetres from the reference point.

In the second part of the experiment participants had to make decisions. It was handed to each subject a second questionnaire with decision tasks, which was exactly the same for all participants and for all groups. In the middle of the decision making questionnaire, participants were reminded to maintain their mood from the first part of the experiment. After the decision making questionnaire was filled out, the participants’ mood change was measured by VAS. Finally all students filled out a feedback form. The design of the experiment avoids the potential framing effect bias, by framing the questions in a neutral choice setting, and the decision making questionnaire is exactly the same for all three groups.

The timeline of the experiment can be followed on Figure 1.

![Timeline of the experiment](https://example.com/timeline.png)

**Figure 1 – The timeline of the experiment – Source: Developed by the author**
Mood induction procedure – evaluation and results

For the Positive (happy) mood induction procedure a writing task was used, where participants had to write about a very happy moment in their lives, and about another very funny experience. They were instructed to let the feelings and emotions to develop in them while they are thinking about that memory and write about it, then they were instructed to try to maintain that induced mood. Participants had to read about 30 words, all naming happy and positive feelings, emotions and reactions, then to mark those which they felt when they were experiencing the told memory and denote those which developed in them and which they felt during writing about that memory. W. A. Mozart’s Clarinet Concerto in A, Opus 107 was played during the first part of the experiment to induce a positive, happy mood in participants. This music was played in the de l’Etoile (2002) experiment for musical mood induction procedure to induce happy mood.

For the Negative (sad) mood induction procedure the same type of writing task was used, where participants were instructed to imagine the death of someone they loved, and specific instructions were given what details to focus on. Participants were instructed to let the feelings and emotions to develop in them while they were thinking and writing about the imagined situation. Participants had to read about 30 words, all naming sad and negative feelings, emotions and reactions. Then they were asked to mark those feelings and reactions, which they thought they would feel in the imagined situation. After that they supposed to mark the feelings which they actually felt when writing about the imagined situation. During this part of the experiment ‘Adagio for Strings, Op. 11’ by Samuel Barber was played, which was used in the Chepenik & Cornew (2007) experiment for the musical mood induction procedure to induce sad mood.

Participants were not informed about the mood induction procedure, or the questionnaire’s purpose or the music’s purpose. They were not instructed to move themselves into any particular mood. They were only told to follow the instructions and to let their emotions to develop.

For the Neutral mood induction procedure for the Control group (C) the same type of writing task was used as in the two treatment groups, except for the valence of the induced mood. Participants were instructed to imagine a usual day when they have to go for grocery shopping and write about what they are buying and what they notice in the grocery shop. During this time Kraftwerk’s ‘Pocket Calculator’ was played, which was used in the Chepenik & Cornew (2007) experiment as musical mood induction procedure.

It could not be expected that the mood effect to work perfectly in this experiment, but results clearly shows that mood does influence decision making.

Mood assessment:

All participants were tested for mood change. Participant’s mood ratings were recorded on Visual Analogue Scale (VAS) after both, the mood induction questionnaire and the decision making questionnaire to see the mood level change over the duration of the experiment. The VAS consisted of a 10 cm line and all VAS mood ratings were measured in millimetres from the reference point on a scale of -50 to 50, where 0 is the reference point.

For the TP group the mean of the VAS1 is 23.48 (SE = 1.72, range = -50 – 50) and the mean of the final mood level of the VAS is 22.61 (SE = 2.03, range = -50 – 50), which means that the original effect of the positive mood induction procedure at the end of the experiment was at 96.29%. For the TN group the mean of the VAS1 is -19.98 (SE = 2.16, range = -50 – 50) and the mean of the final mood level of the VAS is -3.19 (SE = 1.43, range = -50 – 50), which means that the original effect of the negative mood induction procedure at the end of the experiment was at 15.97%. The C group had a mean of the VAS1 of 11.77 (SE = 1.78,
range = -50 – 50) which changed by the end of the experiment to a mean of 11.21 (SE = 1.43, range = -50 – 50).

There was no difference between male and female students in average responses to the mood induction procedure. This means that the mood induction had the same effect on both, men and women, and the differences in the responses to the mood induction were not due to gender difference, but occurred more as a personality difference.

![Mood Assessment VAS](image)

Figure 2 - Average mood change ratings throughout the experiment, measured in millimetre deviations from incoming mood on a visual analogue scale (VAS); 1 – Incoming mood, 2 – Mood at the end of mood induction procedure and 3 – Mood at the end of the experiment – Source: Created by the author based on experimental data

See Figure 2 for the effect of the mood induction procedures for all the three groups. There is significant difference between effect of negative mood induction and the effect of neutral mood, with \( t = -11.42 \) and \( p < 0.0001 \). There is significant difference between effect of positive mood induction and the effect of neutral mood, with \( t = -4.72 \) and \( p < 0.0001 \).

### Decision making tasks – evaluation and results

The first investment question is about investing in a car, which was designed to be a risky investment, paid off with a 5 year mortgage. The second investment question is a monetary investment designed to be very similar in risks and values to the fix investment. Participants had to answer with “YES” or “NO” to the two investment questions, depending whether they are willing to invest or not. The two investment questions are designed in 2 (Invest vs. Not invest) x 3 (mood: happy, sad, neutral) dimensions.

100 of the all 166 participants were willing to invest in a car and 66 sad no to the fix investment. Reasons why participants were rejecting the fix investment are the followings: the risk that the car might be stolen, further expenditures with car are expensive, the use of a car is not ecological, and the main reason was that getting a loan and paying off a mortgage is very risky.

According to the Chi Square Test of Independence for the fix investment question there is a statistically significant difference between the three groups (with sad mood induction, with happy mood induction and control group in neutral mood) on how they decided. There is a relationship between the effect of mood and participants’ fix investment
decision, because the Calculated $\chi^2 >$ Theoretical $\chi^2$ (5.913 > 4.61) for the predetermined alpha level of significance $\alpha=0.10$ and 2 degrees of freedom. Both, subjects in sad mood and subjects in good mood were more willing to make a fix investment, than subject in neutral mood. According to the Chi Square Test of Independence for the fix investment question shows that there is a statistically significant difference between the TP group and the C group, there is a relationship between the effect of positive mood induction and the fix investment decision. Significantly more people were willing to invest in a car from the TP group than from the C group. For the TP group and the C group the Calculated $\chi^2 >$ Theoretical $\chi^2$ (4.481 > 3.84) for the predetermined alpha level of significance $\alpha=0.05$ and 1 degree of freedom. According to the Chi Square Test of Independence for the fix investment question shows that there is a statistically significant difference between the TN group and the C group, there is a relationship between the effect of negative mood induction and the fix investment decision. For the TN group and the C group the Calculated $\chi^2 >$ Theoretical $\chi^2$ (4.058 > 3.84) for the predetermined alpha level of significance $\alpha=0.05$ and 1 degree of freedom. Significantly more people were willing to invest in a car from the TP group than from the C group.

The main conclusion drawn from these results is that the nature (sad or happy) of the induced emotions had no different effect on subjects’ fix investment decision, but the valence of the emotions (not neutral) had a significant positive effect on the willingness to invest in a car. An explanation of the fact that both groups, in positive and negative mood, were more willing to invest in a car than the group in the neutral mood, is that those who were in an induced positive, happy mood perceived the described fix investment situation more optimistically, and those who were in an induced negative, sad mood paid less attention to the risk factors.

According to the Chi Square Test of Independence for the monetary investment question shows that there is not a statistically significant difference between the three groups’ answers. The Calculated $\chi^2 <$ Theoretical $\chi^2$ (0.052 < 5.99) for the predetermined alpha level of significance $\alpha=0.05$ and 2 degrees of freedom, which means that the mood induction had no significant effect on the subjects’ monetary investment decision.

The fix investment question and the monetary investment question are designed to be very similar. The biggest difference being that in one question the subject has to decide for a fix investment and in the other question the subject has to decide for a monetary investment. The results show that there were differences in the responses to the fix investment question and monetary investment question. Subjects in positive and negative mood were more willing to make fix investments than monetary investments, but these differences are not statistically significant.

**The Charness-Gneezy portfolio choice – Investment decisions:**

This investment question was developed based on the experiment presented by Charness & Gneezy (2010). Rewarding participants, it is studied how portfolio choice (how much to invest in risky asset) depends on three mood states, positive (happy), negative (sad) and neutral. It is also studied the difference in investment behaviour for a smaller amount and a higher amount. Of course, the null hypothesis is that investment is the same in each group. The success of the investment in this task is decided by the rolling of a six sided die. To let participants choose the winning numbers gives the illusion of control. The investor chooses also who will roll the die and the number of units to invest in the risky asset for the small amount and for the large amount. All groups have the same task, but they are under a different induced mood. Performance based incentives are used at this question, in order to make it a real deal and to get real answers and not hypothetical answer.
See Figure 3, Figure 4 and Figure 5 for the group changes in the proportional invested amounts from small amount to large amount for the TN group, the TP group and the C group.

**Figure 3** - The changes in the proportion of the invested sum in the TN group, from small amount to large amount – Source: created by the author

**Figure 4** - The changes in the proportion of the invested sum in the TP group, from small amount to large amount – Source: created by the author
As the Figure 6 shows, there are gender differences in investment behaviour for both the small amount and large amount, and this gender difference is observable in all three groups. On average, males invest 60.62% and females invest 53.80% from the small amount, but there is no significant difference between the males’ mean investment and the females’ mean investment ($t = 1.96, p = 0.051$). On average, males invest 42.45% and females invest 37.28% from the large amount, but there is no significant difference between the genders’ investments ($t = 1.4, p = 0.16$).

**Preference for control:**
5 students from each class were chosen to actually play the investment game for presents proportional to their scores. To decide whether the investment is successful or not, a six sided die was rolled. Participants had to choose between the experimenter rolling the die or them themselves rolling the die (perceived as their preference for control).
68.32% (64.81% from the TP group, 67.31% from the TN group and 72.73% from the C group) of 161 participants (5 students did not answer) chose to roll the die, which is preference for control, if they were to be chosen in as one of the 5 students per class. (See Figure 7)

Subjective perception of probability:
Participants had to choose their three winning numbers before rolling the die. The question they were asked was if they felt that the chances to win was better if themselves pick the winning numbers or it was irrelevant who or what decided the winning numbers.

44.85% (53.57% from TP group, 46.15% from TN group and 35.09% from C group) of 165 participants (1 student did not answer) claimed that they felt their chances were better if they chose the winning numbers versus having the numbers randomly generated. This result proves the existence of subjective probability, because subjects were aware that the objective probability to get one of three numbers by rolling a six sided die is 0.5, but still almost half of the subjects thought they had a better chance if they chose their winning numbers. (See Figure 8)
CONCLUSION:

In the past few decades, much research has been done in behavioural economics and many researchers are still working on developing this area. One of the largest topics in behavioural economics, which is studied with great interest, is the decision making process. From the economic point of view it is also very important to understand and investigate the effect of psychological factors on decision making, the perception of risk and uncertainty in decision making, and how emotions influence the decision making. Behavioural economics, and within this the decision making, is a relatively new research area. It is true that much work has been done, but a lot more is needed in the near future.

An individual decision making experiment was run to analyse the effect of mood on investment decisions. The experiment had two goals. The first goal was to test the effect of the mood induction procedures by visual analogue scale (VAS). The second goal was to see how participants, with different induced mood decide in risky investment decisions, what their risk attitude is and whether their mood influenced their decisions and risk preferences. The experiment was designed to contain two treatment groups (happy and sad mood induction) and one control group (neutral mood induction).

People perceive differently fix investments and monetary investments, even if their values are almost the same. It can be concluded that context matters for people, because subjects responded differently to the fix investment question and the monetary investment question.

It can be concluded, that mood had significant effect on fix investment decisions. Significantly more subjects were willing to make a fix investment in a non-neutral mood (in both positive and negative induced mood) than subjects in a neutral mood. An interesting observation is that the valence (positive and negative, non-neutral) and the degree of the induced mood had a significant effect on the fix investment decision, but subjects in positive induced mood and in negative induced mood behaved similarly. An explanation may be that participants in induced happy mood perceived the description of the fix investment question more optimistically, accordingly more subjects from the positive treatment group decided to make the fix investment than subjects from the control group. Subjects in induced sad mood were less receptive to the risk factors than the neutral group (they had no good mood to maintain, so by taking the risk to invest, subjects had less to lose from a psychological point of view), and sad yes to the fix investment question to improve their mood. At this fix investment question we can also observe loss aversion and not only risk aversion, since there are negative outcomes. It may be assumed that subjects in positive and negative induced mood are less loss averse than subjects in an induced neutral mood.

The Charness and Gneezy (2010) portfolio choice question was used in the experiment, where participants had to decide how much to invest in a risky asset. Extending the portfolio choice question to a larger amount, it was possible to test whether there is a proportional change in subjects’ investment decision caused by the change in the size of the amount of money proposed for investment. Subjects invest in proportion significantly less from a large amount than from a small amount. The conclusion would be that risk aversion and loss aversion increases with the size of the amount proposed for investment.

Another finding based on the analysis of the experimental data is that participants have preference for control. More than two third of participants preferred to have control than to leave that control to the experimenter. People prefer to feel they have control over their situation, especially in the case of economic questions when it is about their financial well being.
The existence of subjective probability was demonstrated with this experiment. Almost half of the participants against their knowledge of the actual probability believed that they had a higher chance of winning if they could choose the three winning numbers themselves in a ‘rolling a six sided die’ game, rather than having them randomly generated. Subjective probability aroused the attention of many economic researchers and it became an important research element of behavioural economics and decision theory.

According to the test results, subjects are influenced and guided by their emotions and their feelings not only unconsciously, but even consciously. About 80% of participants claimed that they were consulting their feelings and intuitions in their decisions. This suggests that most people trust their feelings and intuitions, and consciously use them to make a better financial decision.

The results of the experiment show that mood does affect investment decision making. This suggests that mood might influence people when they make their decisions for real investments and with real money. The magnitude of the influence might differ in real life from the influence observed in the experiment, where hypothetical questions were used. It can be concluded, however, that mood influence exists and should be considered when investment decision making is researched.

The results of the experiment can be applied to further behavioural economic research. For instance banks and corporations could use such information to better understand how their clients make their investment decisions. They can analyze the effect and the influence of emotions and mood on people's investment decision-making. They can use the analysis and its results for preparing and promoting investment and credit offers. More advantageous strategies could be worked out by paying attention to people’s feelings and moods when they make their decisions.

It is also true that the experiment results could be useful to the individual investors. If people know that their moods and feelings influence their investment decisions and that these influences play an important role in the decision making process, they can pay attention to this fact when they consider investment and credit offers, and when they make their actual investment decisions.

To develop and further improve economic models and economic theory, we need to better understand human behaviour under the influence of emotions and mood in the case of investment decision making, risk aversion and other economics related issues.

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