

Masteroppgave

Neuroeconomics and Hyperbolic discounting

Av

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Masteroppgaven er gjennomført som et ledd i utdanningen ved Universitetet i Agder og er godkjent som sådan. Denne godkjenningen innebærer ikke at universitetet inntår for de metoder som er anvendt og de konklusjoner som er trukket.

Veileder:

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Preface

I have chosen to write this assignment about two relative new fields in Economics, neuroeconomics and hyperbolic discounting. After four and a half years studying economics I want to try and use my knowledge to look at and analyze something that is relative new and unexplored. I find the idea of combining research from neuroscience and economics very interesting. I started reading some articles about neuroeconomics and I agreed with many of the statements that were made. My model is also about hyperbolic discounting, this is a alternative to the old exponential discounting model. I find hyperbolic discounting functions interesting to write about because they open more to the unpredictable human behaviour

My assignment also includes a pilot for an experiment. This is also some of the reason why I wanted to write about these areas. To get the opportunity to do an serious experiment is a good way of seeing how the economic researchers work, this is not something that I have done before in my education. I had Jochen Jungeilges as my supervisor on my theses. He has much experience on this type of research and I was therefore able to get the help I needed in order to carry trough the experiment.

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Abstract

The exponential discounting method is today the most used in economics, and it has been the dominant discounting method for many years. However there are many economists that have started to question this method. One of the reasons for this is that it does not capture the way we humans tend to behave in many types of discounting situations. In this assignment I will introduce the hyperbolic discounting method. This is a more flexible discounting function that opens for human irrationality and preference reversals.

The brain holds the answer too many of the questions about human behaviour. Over the last years a field called neuroeconomics have captured the attention of many economic researchers. Neuroeconomics opens the door for neuroscience into the economic theory. Although this is a young field in economics it has produced a lot of interesting discoveries. By using tools from neuroscience we are able to understand the physiological process that finds place when we are facing different kinds of economic decisions, like discounting decisions. I start my theses by giving an introduction to this research, and present some of the discoveries that have been done.

I will then use the knowledge form neuroeconomics to see if it can enlighten the discounting theory. Then I will present a framework I have made, this is a tool to analyze some of the decision we makes.

At the end of my assignment I will present a pilot of an experiment that I have performed. This is a discounting experiment to se what discounting method that fits the subjects in the experiment best. However I have just done a pilot for this experiment so the number of subjects that were participating is not enough to make any certain conclusions, but I will present a analyze of the material I got from the experiment. I will also give a run trough of the process of performing the pilot.

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1 Introduction

The problem I want to approach in this assignment involves neuroeconomics and hyperbolic discounting. Since neuroeconomics is a relative new field, that I find very interesting, I want to give a presentation of it. Since neuroeconomics has a lot to offer to behavioural economics I will also include some material to this.

Approach to the problem;

How can Neuroeconomics contribute to explain human discounting, and is the hyperbolic discounting function a better alternative then the exponential discounting function.

To manage to get this assignment the way that I want it I need a little room, my problem can not be to strictly delimited. The materiel that I'm working with in this assignment is different types of articles. It is therefore more difficult to get specific theory. The way I will do it is to try to give an overview and then use that overview on more specific areas.

To answering the last part of my problem, if hyperbolic discounting functions are a better alternative then the exponential, I will try to solve in to different ways. The first method to solve this is by implementing neuroeconomcis theory into discounting theory. The second way is to do an experiment that is designed to answer this question. I will however just do an pilot of the experiment so I'm aiming more at introducing the process and giving a short analyze of the results , rather then arguing that my results can tell us something precise.

2 Neuroeconomic Theory

The field of Neuroeconomics is a new and very exciting way to look at economic behaviour. There are many authors that have started to show interest in this field. One of the reasons is that neuroeconomics can help us understand the side of the economy that in the past has been ignored. Like why individuals are often acting irrational and why we make decisions that are not in our own best interest. This is also the reason why neuroscience is useful to understand many areas in the society today, and can help us understand social problems like gambling, addictions and other irrational actions. Neuroeconomics include the brain to try to understand these things. With this new knowledge of the link between the brain and economic behaviour it is a possibility that the way of economic thinking could be drastically changed over the next few years.

2.1 Research tools

In this section I will introduce some of the research tools that are being used in neuroeconomics, PET, fMRI and MEG.

PET

PET stands for Positron Emission Tomography, and is a type of nuclear medicine imaging. It uses tiny amounts of radioactive material to diagnose or treat diseases and other problems that could be within the body. It is usually painless and you insert the radioactive material into the body by a vein, by swallowing it, or you could inhale it as gas. The material in your body will send out energy in form of gamma rays. These gamma rays are detected by a device called a gamma camera(www.radiologyinfo.org)¹. When PET is used in neuroeconomics studies they watch how the radioactive material accumulates in different areas of the brain. This way they can see what brain parts are being active when the subject faces different economic questions and decisions.

FMRI

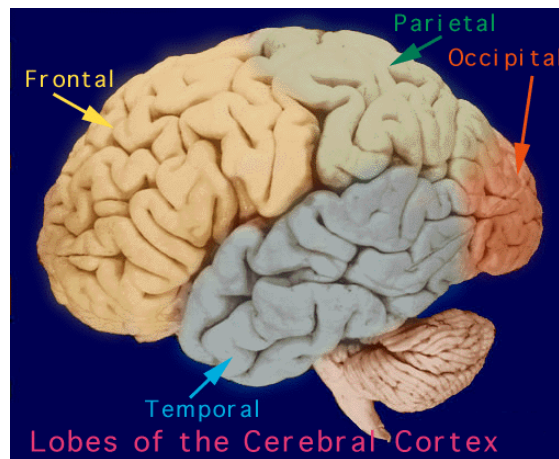
FMRI was first used on humans in 1992. The functional MRI measures the amount of oxygenated and deoxygenated blood in the different brain areas (Zack, 2007)² fMRI stand for Functional magnetic resonance imaging. That it is functional means that the subjects are performing some activities during the MRI test. This makes us able to see what part of the brain being active when a subject is performing an assignment. In neuroeconomics the assignment is to use fMRI while getting an answer to different types of economic questions.

MEG

MEG stands for Magneto EncephaloGraphy. MEG is a device that measures tiny magnetic fields in the brain created by the electric current flowing within the neurons. It has the capacity to measure this electric activity with millimetre accuracy. The first MEG system was presented by Dr. Cohen in 1968. Today it is seen as a big source to figure out the workings of the human brain. (www.c-nbh.com)³

There are many tools that exist to analyze brain activity. I will however in this assignment not get into more of the technicalities of the tests. I will focus on the economic part of neuroeconomics and try to implement the findings that have been done in neuroscience to enlighten the economic way of thinking.

2.2 Brain Areas



Brain Parts

Frontal Lobes:

- Motor Functions
- Higher order functions
- Planning
- Reasoning
- Judgement
- Memory

As we see from the points given above, the frontal lobe controls our cognitive thinking. This is why this area is one of the most central in the studying of neuroeconomics. This is the part of the brain we rely on to save us from the stupid choices. That humans have such developed frontal lobe is one of the things that separate us from the animals. Thanks to this part of the brain we have the possibility to make choices that conflict with our instincts for the better of our future.

Occipital Lobes:

- Controls Vision
- Colour Recognition

Parietal Lobes:

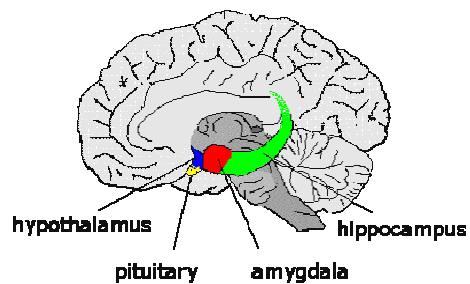
- Cognition
- Information Processing
- Speech
- Visual Perception

Temporal Lobes:

- Emotional Responses
- Hearing
- Memory
- Speech (biology.about.com)⁴

The limbic system

The limbic system plays a very important role in our emotional life. It is a complex system that is located just under the cerebrum.



The limbic system

1. Hypothalamus

This part of the brain is located under the thalamus, and it is one of the busiest parts of the brain. The hypothalamus works as a brain thermostat. It signals when it gets too hot by turning off some of the parts that are creating the heat. Other areas where the hypothalamus plays a role is the feeling of being hungry, thirsty, the response to pain, level of pleasure, sexual satisfaction, anger and aggressive behaviour. It also regulates things like blood pressure, pulse and breathing (webspaceship.edu)⁵.

2. Hippocampus

This part of the brain is located as two horns behind the amygdala. It seems to play an important role when it comes to converting short time memory into long term memory. This has been shown by researching people with damage on the hippocampus. They have no ability to create new memory. But the things they learned before the accident is untouched (webspaceship.edu)⁶.

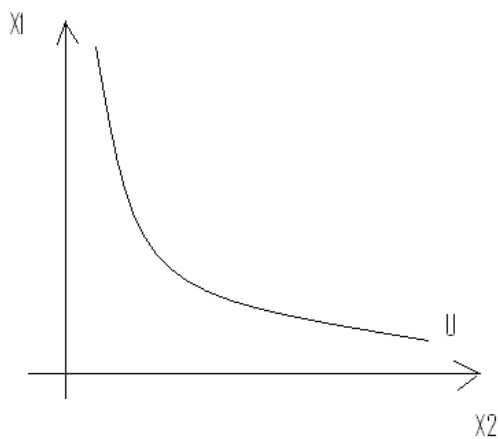
3. Amygdala

The amygdala is located on each side of the thalamus. Research has shown that stimulation of this brain part leads to aggression. It has also been shown that if you remove this part of the brain from an animal, the animal becomes much more tame and tolerant. It also shows that removing this part of the brain makes animals indifferent to stimuli that would normally cause aggression and even sexual response (webspaceship.edu)⁷.

2.3 Utility Functions

In the next section I will introduce some of the areas that will help give a better understanding when it comes to neuroeconomics.

Utility functions and preferences



This is a graph of a utility function as we are used to see it from classical economic theory.

The U line illustrates the consumer choice between two goods, X1 and X2. We then get the utility function:

$$U = U(X1, X2) \text{ (Arild Sæther, 1994)}^8$$

The U is the utility the consumer gets from the goods combination that he chooses along the U line. This theory is often used to show how a subject can maximise their utility within their

restrictions like wage.

To approach utility functions like this have some advantages. It is easy to handle mathematical, and it help us illustrate how the consumers will maximize their utility. But is it possible to explain real life economic behaviour from this theory? If you say that X1 = cigarettes and X2 = food if you then should maximize your utility you would spend all your money on food, since food keeps you alive and cigarettes kills you. And don't different subjects have different preferences?

These are some of the problems that neuroeconomics can help us handle. One of the reasons is that up until now utility has been a strictly theoretical term. But in neuroeconomic studies it has been shown that different regions of the primate brain appear to be physiologic utility functions. These utility functions are decided by firing rates that appear in the brain. By observing these firing rates we can see that women are more risk averse than men, and observations like these show us that it is now possible to get concrete proof of different findings. It is also important to understand that the preferences that exist in the brain will change over time. The reason is that the brain is a highly adaptive organ, and as we learn more about different things our preferences will change (Park and Zack, 2007)⁹. This makes sense, if you for instance don't know how a hamburger tastes like, you don't have any

preferences for it. But when you have tasted it, you create preferences based on how much you like the taste. This also applies for learning. You may change your preferences as you learn more about a specific thing.

To recognize these preferences in the human brain may have a large influence on many economic fields, one of these fields are advertising. The goal of advertising is to create preferences in a subject so that the subject feels that the product will give him some sort of utility.

2.4 Neuroeconomics experiments about preferences in the brain

There have been done some experiments on how we respond to advertising. In one study there was used a MEG to study the neural response to TV advertisements. The data showed us what part of the brain that reacted to the different advertisements. Some of the advertisements were cognitive, based on facts and so on, and some was affective, based on drama and humour. The result implied that the cognitive rather than the affective advertisements activated the cortical centres associated with the executive control of working memory, and maintenance of higher-order representations of complex visual material. The experiment also showed that it was greater inter-subject variations to the affective advertisements. (Sven Braeutigam, 2005)¹⁰

In another experiment they used PET to measure brain activity when subjects were asked to make decisions from a menu on what they would like to eat.

The amygdala was activated by high – incentive menus whether or not they had to choose. And the activation varied as a function of individuals own subjective ratings of incentive value. This indicates that the amygdala can give a picture of the subject's preferences. The amygdala is located in the temporal lobe and one of its functions is Emotional Responses. When the subjects had to choose the food from the menu that they preferred, there was activity in the orbitofrontal cortex. The Orbitofrontal is located in the frontal cortex and has cognitive process functions like decision making. We see how the different parts of the brain control different functions and take part in the decision. When we see something we like, it triggers our emotion (amygdala) and when we evaluate to make a decision, there is activity in the cognitive part of the brain (orbitofrontal cortex). (Sven Braeutigam, 2005)¹¹

In this experiment they use fMRI to investigate the reward properties of cultural objects. The subjects are watching different kinds of cars, with different social status. The experiment goal is to see if there is any correlation between the social status of the cars and neural activity. The fMRI data showed that the sports cars triggered significantly more activity in the reward regions of the brain. Which indicates that goods that has social “value” gives a rewarding sensation. Social status is by that a part of forming our preferences when we are choosing cars. (S. Erk, 2002)¹²

2.5 Sympathy

Sympathy is a word you don't hear too much about on the economy literature. But it is an important factor when we argue the statement that humans are rational subjects that acts in self-interest. Neuroeconomics research shows that humans have something called mirror neurons. Mirror neurons are a specific class of visumotor neurons that discharge both during action production and during action observation. This suggests that our understanding of actions that other humans make, are based on a mechanism that directly matches the visual representation of observed actions with our own motor representation of the same actions. (Rizzolatti and Sinigaglia, 2007)¹³ If you say that sympathy is to be able to “place ourselves in someone else's situation” (David Hume, 2005),¹⁴, then mirror neurons can give an explanation of what that really means. If you by watching someone making a movement you feel the movement yourself, it seems reasonable to not want to see a hurtful movement. This is a clear example on how neuroeconomics can give us hard evidence on a subject that we did not understand in the past.

2.6 Trust

Trust is a factor that influences almost every decision we make when we are cooperating with other humans. In the economic models that exist today this factor is not taken into consideration. It is assumed that humans are untrusting and acting in self – interest so that we can maximize our own utility. From neuroeconomics we can learn more about trust, and why it exists. In our brain there is a hormone called oxytocin. This hormone reduces the fear of trusting strangers. It has also been proved that if you inject this hormone into a human the

level of trust increases, and motivates us to trust other humans.(Park and Zack, 2007)¹⁵ There is also a difference from country to country how much oxytocin we possess.

The level of trust will also have a grate influence on how we make strategic decisions. If you for instance look at a game, the outcome will be different if the subjects in the game trust each other.

Neuroeconomics has also looked on how rational we are under a game situation. The game that has been used is the ultimate game. The ultimate game is that one subject has to split a given amount between himself and another subject. The other subject then has to choose if he want to accept the offer. If he does he gets the money, but if he refuses then none of the subjects gets any money.

If the subjects are acting rationally, the subject that is splitting the money will give the other subject as little amount as possible to maximize his own utility. The other subject will then accept the offer (no matter how small it is) because little money is better than no money. The problem is that in real life the game does not end like this, the results from the game indicates that a subject will reject an offer that he feel is unfair. The reason for this irrational behaviour is that humans get satisfaction from punishing another human that violates the sharing norms. Neuroeconomics show that brain is producing a rewarding sensation when we are doing this punishing. It is a form of testosterone that is being activated when the low offer is given to the other subject. Research also shows that this reaction is much stronger in men then in woman. .(Park and Zack, 2007)¹⁶ This is also part of the reason why we are not always acting in self – interest, because we get a rewarding sensation from the brain when we take actions against those who are not acting fair.

There has been an experiment on trust and punishment using PET. In this experiment they use the game social dilemma. This is a game that uses the social preferences that is in humans to see whether or not we get rewarded from punishing. The social game is that a subject A have a amount of money that he can keep or give to subject B. Subject B then have to decide whether or not to give his amount of money to A (the amount is equal to the amount A had) Subject B know what subject A's was when his making his decision. The game showed that despite of the rational condition that exists in economic theory the players gave each other the amount of money. This is because of our social preferences, and because we trust the other player to give the money back (oxytocin).

The other part of the experiment was to see what happened if player B did not return the money to subject A, and subject A then had the possibility to punish player B for being unfair.

There are two forms of punishing:

1. A makes B lose money but doesn't lose any money himself
2. A makes B lose money but loses money himself.

In alt 1 every subject A chose to punish player B, and there was activation in the dorsal striatum (brain region connected to the reward system). In alt 2 also many of the A subjects chose to punish, and the activation in the dorsal striatum was the same. But this time there was also a strong activation in the Prefrontal Cortex (reasoning and decision making). That's because in this case subject A had to evaluate if the price for punishing was right. (Fehr, 2005)¹⁷

As we see from the sections above there is a lot of interesting research that has been produced in the field of neuroeconomics. And some of them enlightens some of the theoretical questions from the older economic models, and some help explain some of the more daily questions that we have.

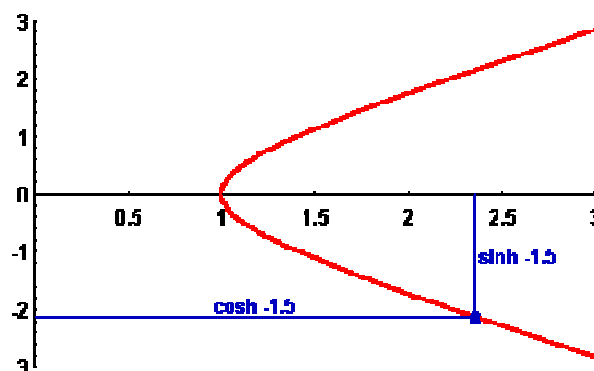
3 Hyperbolic Discounting

Hyperbolic discounting is an alternative way to discount than the exponential discounting.

Hyperbolic is a term from mathematics which describes a function. Hyperbolic sine and hyperbolic cosine are the two basic hyperbolic functions. The important thing to understand is that the hyperbolic discounting functions have other properties than the exponential function.

This could open for including more variables into the discounting.

The standard hyperbola (hyperbolic function) looks like this. (www.sosmath.com)¹⁸



Graph of a hyperbolic function

We know that the exponential discount function is constant over time. The hyperbolic discount rate will on the other side fall as the discount period move further away. This could explain some of the trouble we humans have with self regulation.(Laibson ,2004)¹⁹ In Golden eggs David Laibson illustrate the hyperbolic discount rate like this

$$\gamma/(1 + \alpha\tau)$$

τ tells us how many periods away the discount time is, and then we see that when τ is increasing the discount factor will decrease. In this example we discount with a different discount rate when the discount period is close then when it is far away. According to exponential discount theory the discount rate will not be changed because of this. We call the period before the discount period starts front end delay. This is one of the factors that I will be testing when I'm doing my experiment later in the assignment.

3.1 Preference reversals

In the front end delay situation there is a preference reversal. This is a situation where the subject that is discounting is changing his preferences. Preference reversals is one of the reasons why it could be better to use a hyperbolic discount function rather than a exponential one. There are many authors that have started to show interest to this phenomenon. I will in this section explain more about preference reversals by using different examples.

.
 If a subject is asked if he wants to trade one apple today for two apples tomorrow most subjects will reject. This means;

$$v_t \geq v_{t+1} - c_{t+1}$$

The increase in utility for receiving two apples is less than the cost of waiting one day.

$v_t =$ Utility of receiving reward at time t

Time t is when the discount period starts

$v_{t+1} =$ Utility of receiving reward at time $t+1$

Time $t+1$ is when the discount period ends

$c_{t+1} =$ Cost of receiving reward at time $t+1$

Cost c is the cost of waiting to receive reward when the discount period ends, in contrast to receiving when the discount period starts.

If you then ask the same subject if he wants one apple in one year or two apples in one year and one day, most subjects would choose the two apple alternative. This means;

$$v_t \leq v_{t+1} - c_{t+1}$$

The increase in utility for receiving two apples is larger than the cost of waiting one day.

We have to assume that one apple in one year give the same utility in one year that one apple today gives today.

$$v_t (\text{One apple today}) = v_t (\text{One apple in one year})$$

And

$$v_{t+1} (\text{Two apples tomorrow}) = v_{t+1} (\text{Two apples in one year and one day})$$

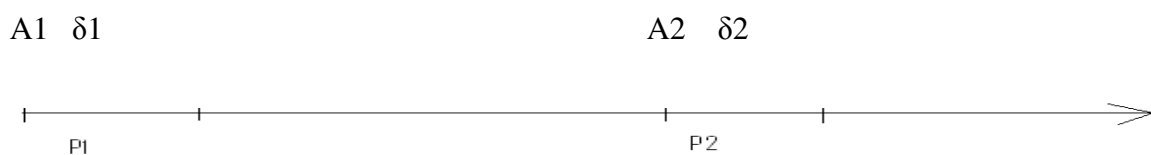
Given those assumptions;

$$c_{t+1} (\text{Waiting one day, today}) \neq c_{t+1} (\text{Waiting one day, in one year})$$

This is a problem for the exponential discounting theory because there is an inconsistency in the discount rate. If we denote the discount factor as

$\delta (1,2,\dots,n)$,

The numbers in the brackets is the discounting periods. If we look at a time line:



The two periods ($P1, P2$) is both one day long.

In this example the subject is on the A1 point on the time line, and he chooses for him self both in the A1 point and in the A2 point. But what will happen when one year goes and you ask the subject again. Then the discount situation in A2 will be the same as it was in A1. Then it seems reasonable to think that the subject will choose the same as in the first state, that he rather would have one apple in A2 (that now means today) then tomorrow. This is what we mean when we say preference reversals.

The choice made by “self” in the A1 situation about the future self in the A2 situation, is not the same choice that the self in the A2 situation would have made.

As the example explained the discount factors in this case is $\delta_1 \neq \delta_2$ if this had been exponential discounting these factors have had been equal to each other.

I have no illustrated that with front end delay there is not always an exponential discounting.

Now I will use credit card as an example on how these preference reversals could effect us financially. Credit card is used by many people and this despite the fact that they are very expensive. I will in this section focus on the preference reversals connected to credit card, and I will in the next chapter try to explain why we get these loans, using neuroeconomics. I will then use consumption loans instead of credit card.

The fact that we humans tend to discount with a higher discount rate when the discount period is today rather than in a year indicates that we have a “Passion for the present” (Slonim, Carlson, Bettinger, 2007).

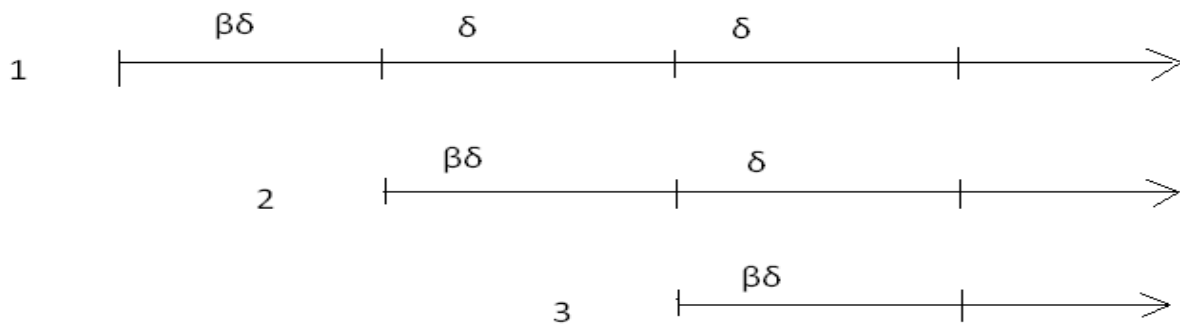
The credit card company offers you a one month interest free credit on 10 000 NOK. You think that this is a good deal and take the credit. After one month the interests start to run. Your plan is to pay your credit back when your next pay check comes in one month, in this case you will have no cost attached to the credit. The reason you know that you will pay back is that interest rate, which start to run after one month, is larger than the cost of paying the money back. This means;

$$v_t \geq v_{t+1} - c_{t+1}$$

The cost of paying the interest rate is larger than the utility of not paying back the money.

When the case is like this we denote the discount rate with δ . From the assumption 1 we know that $c_{t+1} \geq \delta$, and this is why the subjects plan, is to pay the money back after one month.

But as I said human's has a tendency to prefer the immediate payoff, and this is illustrated trough the passion of the present. We are going to denote the Passion of the present by β .



When the interest free month is over the subject is at the start of time line 1. Now the subject's discount rate has changed from δ to $\beta\delta$. This is because this period no longer is the future and then the subject inserts the passion of present discount rate β . Then the plan to pay back have changed because now;

$$c_{t+1} \leq \delta * \beta$$

The cost of paying one month interest is less than the cost of paying back the money.

The next month the same happens, time line 2, and the subject will again choose not to pay back the money, because the passion for the present gives the subject a reversal in his preferences.

Like this it continues, and the credit card companies make a lot of money. Just because we take the credit loan with other preferences then what we got when we are going to pay the money back. Of course this does not apply for every body, and some people pay there credit card loans back at time. But in many cases this example illustrates a good picture of how preference reversals occur in daily financial dilemmas. And the exponential discounting function does not capture this phenomenon.

I will now try to illustrate how these cost and utility functions would look like in a graph.

In the table bellow, you have;

Exponential discounting factor;

$$\delta = (1 + 0,06)^t$$

The discount rate 0,06 is random, just so I can show it with real numbers

Passion for the present;

$$\beta = (1 + 0,08)^t$$

The discount rate 0.08 is random

Hyperbolic discount rate;

$$\omega = \sum_{i=N1}^{30} \beta_i \sum_{i=N1, N2}^{30} \delta_i$$

N1 = periods when you have to make a decision

N2 = every period except N1

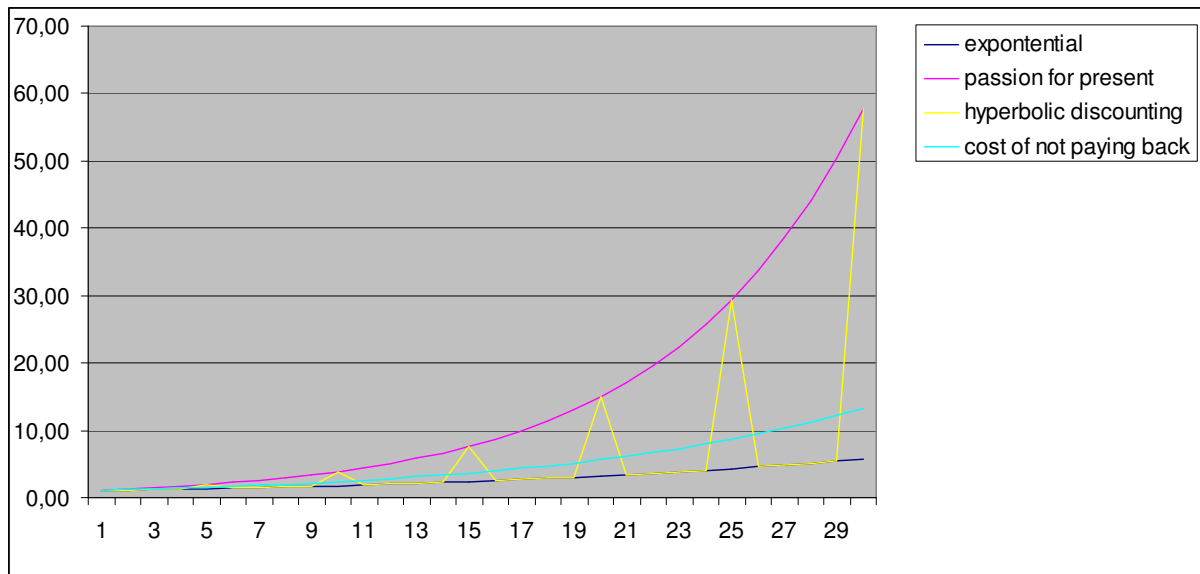
In the hyperbolic discounting function the subject discount exponential in every period except the periods where he has to decide to pay the credit loan back or not, (N1 = 5,10,15,20,25,30). In these periods he includes the passion for the present function into his discount rate.

Cost of not paying back (the credit loan);

$$c = (1 + 0,09)^t$$

The cost value 0,09 is random

Period	exponential	passion for present	hyperbolic discounting	cost of not paying back
1	1,06	1,14	1,06	1,09
2	1,12	1,31	1,12	1,19
3	1,19	1,50	1,19	1,30
4	1,26	1,72	1,26	1,41
5	1,34	1,97	1,97	1,54
6	1,42	2,25	1,42	1,68
7	1,50	2,58	1,50	1,83
8	1,59	2,95	1,59	1,99
9	1,69	3,38	1,69	2,17
10	1,79	3,87	3,87	2,37
11	1,90	4,43	1,90	2,58
12	2,01	5,07	2,01	2,81
13	2,13	5,80	2,13	3,07
14	2,26	6,64	2,26	3,34
15	2,40	7,60	7,60	3,64
16	2,54	8,70	2,54	3,97
17	2,69	9,96	2,69	4,33
18	2,85	11,41	2,85	4,72
19	3,03	13,06	3,03	5,14
20	3,21	14,95	14,95	5,60
21	3,40	17,11	3,40	6,11
22	3,60	19,59	3,60	6,66
23	3,82	22,43	3,82	7,26
24	4,05	25,68	4,05	7,91
25	4,29	29,39	29,39	8,62
26	4,55	33,65	4,55	9,40
27	4,82	38,52	4,82	10,25
28	5,11	44,10	5,11	11,17
29	5,42	50,48	5,42	12,17
30	5,74	57,79	57,79	13,27



Graph of the results

From this graph we see why the subject never would want to pay back the money if my hyperbolic discounting approach is correct.

The subject has a plan to discount like the exponential line in the graph; this is his cost of paying back the loan.

Exponential (cost of paying back) < cost of not paying back

But in every decision period, N1, he gets a passion for the present and jumps up to the passion for present line;

Passion for the present > cost of not paying back

Of course he plans to go back to the exponential line after this but in the next N1 period the same thing happens.

So for every N1 the cost of paying back the money is larger than the cost of paying the interest.

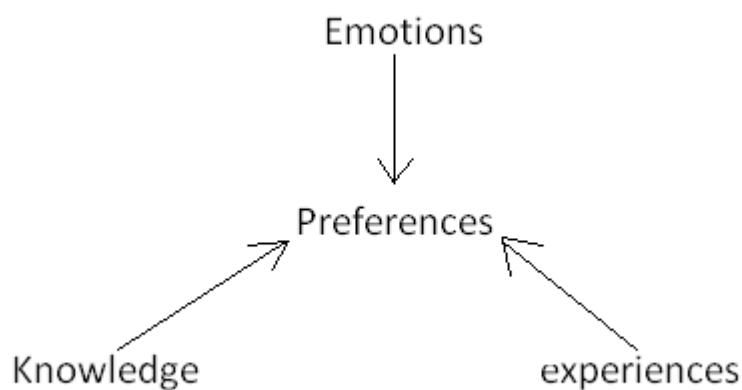
In the graph I have chosen to have the cost functions that are based on the discounting factors. This is why the lines in the graph are increasing instead of having a downward slope like discounting functions normally are illustrating. I have done so that I could put all the lines into the same graph.

4 The EEK framework

In this chapter I will try to create a framework, the EEK framework (EEK = emotions, Experience and Knowledge), so that I have an analyze tool. I want to see if it is possible to implement the knowledge about neuroeconomics into different areas in economics and daily life decision making. So in contrast to the previous chapter, where I explained *what* happened, I will in this chapter use neuroeconomics to find out *why* it happens. There are some things that are important to tell about this framework. The goal is not to get a perfect overview of neuroscience. What I want to do is to simplify the theory from neuroscience by categorizing it into 3 groups. In this way it could be possible to make a framework which is easy to handle, at the same time as it brings in some of the most important discoveries from neuroscience. This framework is inspired by the theory I have written about neuroeconomics earlier in the assignment, combined with my understanding of the theory.

- Emotions
- Experience
- Knowledge

These are the three groups I have chosen to include in the framework because in my opinion, they are the foundation when it comes to forming our preferences. Our preferences tell us what decision we are going to make, and why we make them.



The EEK Framework

This model shows how emotions, knowledge and experiences influence our preferences. From neuroeconomics we know that preferences and utility functions exist in our brain (Park and Zack, 2007). These preferences decide how we make our decisions. This means that the more we learn on how these preferences are being formed, the closer we are to understanding why humans make the decisions they do. Neuroeconomics contributes in this field. Based on this the main goal of this framework is to;

1. Help us explain and predict human decisionmaking and behaviour.

As we see from the framework there are three variables that influence our preferences. I will now explain what these three variables contain, and why I have chosen to bring them into my framework.

Emotions

In many of the decisions we make, emotions has a huge influence. When I say emotions I also choose to include urges like hunger, thirst, sexuality and so on. The level of influence emotions have on a decision, is off course different from decision to decision. I would still argue that in almost every big decision it will have some influence. We know from research with the ultimate game that humans make irrational decisions in order to punish other humans that don't play by the social rules. This is a good example on how emotions influence our preferences and by that also our decisions.

Neuroscience has told us that the limbic system is the brains emotion centre. Different kinds of experiment in neuroeconomics show that in different kinds of situations, the brain releases substances that give us a rewarding sensation. This is for instance the case when we are punishing another player in the ultimate game.

Experience

Experience could be seen as a form of knowledge, but I think it is important to separate these two areas. With experience I'm talking about the knowledge we possess because we have been through a similar situation before, or we have seen someone else go through it. The main difference between the two factors, experience and knowledge, is that experience is something you have learned by experiencing it, while knowledge is something you have learned through "education". So I would argue that a person that has learned about cancer in medical school doesn't have the same preferences for smoking as a person who has had cancer. This is the difference that I would like to get into my model by separating these two variables.

The brain is an adaptive organ, this means that when we experience something we learn from it, and our preferences could change. This could explain why we make different choices at different ages. Another fact we have from neuroeconomics is the new knowledge about mirror neurons. As said earlier mirror neurons is explained by firing rates that is being fired both when we do something to our selves, and when we see someone else do it. So when we see that something happens, it gives us another experience then by hearing about it or reading about it. An example: It is more likely that people who have seen children starve with their own eyes will give money to charity, than people that have read about it in the paper.

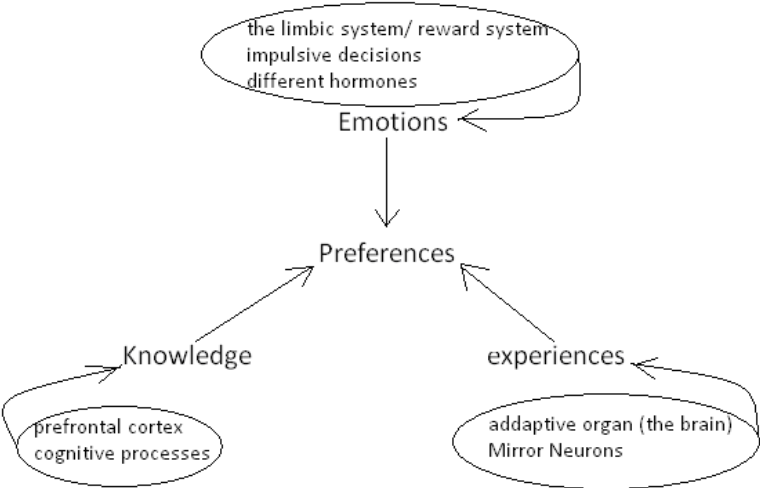
Knowledge:

All humans possess some sort of knowledge and we use this knowledge when we are making decisions. One example could be that a subject that is studying economics would make different decisions when it comes to money than a subject studying medicine. On the other hand, a subject studying medicine would make other decisions concerning his health. The main point is that different kind of knowledge makes us view situations differently.

Neuroeconomics has told us that the prefrontal cortex is the brain area that controls our abilities for reasoning, planning, judgement and memory. All of these abilities are important

factors when it comes to knowledge, and our use of knowledge. In my framework I therefore connect the prefrontal cortex to knowledge.

The framework will look like this when we are including the knowledge about the brain into the framework.



The EEK framework with connected neuroeconomics factors

Preferences and utility

The EEK framework is a device for understating how human preferences are being formed. One of the most exciting findings in neuroeconomics is that it exists utility functions in our brain (Park and Zack, 2007). To understand the utility functions of a human you have to know what its preferences are. This framework also opens for irrationality, which differs from the older economic models. Rationality is defined as essentially, consistency in choices (Park and Zack, neuroeconomic studies, 2007). This is not always the case. In order to meet the goal of this framework that I mentioned above it is important that the model is flexible. This is because the human behaviour is NOT always rational and calculating.

In this next section I will use my framework to analyze some different decisions situation that a person could face some time in his life. My first example will be about smoking. The reason I chose to write about smoking is that one of the goals of neuroeconomics is to get new insight in the problem of addiction. Everybody knows that smoking is bad and that it could be a direct cause of death. It seems reasonable to say that it is irrational to smoke. In addition to be a threat to our health, it cost a lot of money. In Norway a pack of 20 cigarettes cost about 70 NOK. If you smoke 20 cigarettes a day, it will cost you 25 550NOK in a year. This is about a month salary for a Norwegian worker. So why do so many people choose to smoke? Is it because of the addiction? It could be, but that doesn't explain why so many people quit for a year and then starts again. Below I have used the EEK framwork to se how our preferences for smoking are being formed.

Preferences		
Emotions	Experience	Knowledge
<ol style="list-style-type: none"> 1. gives you satisfaction, and releases you from the urge for nicotine <ul style="list-style-type: none"> • pro 2. cigarettes make you happy <ul style="list-style-type: none"> • pro 3. it helps you relax <ul style="list-style-type: none"> • pro 	<ol style="list-style-type: none"> 1. it taste good <ul style="list-style-type: none"> • pro 2. nice in social gatherings <ul style="list-style-type: none"> • pro 3. haven't affected your health so far <ul style="list-style-type: none"> • pro 	<ol style="list-style-type: none"> 1. it can kill you <ul style="list-style-type: none"> • con 2. it costs a lot of money <ul style="list-style-type: none"> • con

EEK analyze table, Smoking

This is what you know about smoking, and what you feel about smoking. Under each statement I have written pros or cons, which means if the statement is pro or con smoking. All of these statements form your preferences about smoking. You will smoke if your pro's are stronger than your con's. A person that is addicted to cigarettes has very strong preferences on why he should smoke; the challenge is then to make his preferences for not smoking even stronger. We see many attempts to do this today in Norway. The government has marked every cigarette pack with warning notes, and has had commercials on TV to show the bad effect that smoking has on your health. All of these things are being done to make our preferences for not smoking stronger. Another attempt to get people to stop smoking is to raise the price on cigarettes, which may be the best way to make people quit. If you make smoke so expensive that we have to choose between smoking and other things, it may be that our preferences for other things would be stronger, and we would stop smoking. There are also some things that could give us negative preferences for smoking. If you have experienced cancer yourself, or someone that close to you have gotten cancer because of smoking, it would give you stronger preferences for not smoking. You could say that we have to provide enough arguments to the prefrontal cortex so that it would make a decision not to smoke.

I have earlier in this assignment written about credit cards to show how preference reversals exist. I will now use the EEK model to look at consumption loans. These are loans you can receive without having security for the money that you borrow, and you can get the loans really fast. The down side of these loans are that they usually have a high interest rate, so although the monthly payments are small the loans are expensive. In Norway there is a huge supply for these loans, and there are a lot of commercials and other kinds of advertising for them. This indicates that there also is a large demand in Norway, despite the fact that they have gotten many people in trouble because they don't have the ability to pay back. Before I use the EEK model to analyze why people want these types of loans, I will show some of the terms to have these loans. I will use Citibank as an example:

If you get loan on 70 000 NOK you have to pay a interest rate in:

12.08% (this includes the different fees) (www.citibank.no)²⁰

This is almost twice the interest rate of getting a house loan. The difference is as mentioned above that to get a house loan you have to have some security for the amount that you are borrowing. When I'm now analyzing consumption loans I will first set up the table like I did

with smoking, but then I will also see how the suppliers of these loans advertise to trigger people to take the loans they offer.

Preferences		
Emotions	Experience	Knowledge
<ol style="list-style-type: none"> 1. you want the excitement of buying something nice <ul style="list-style-type: none"> • pro 2. you want the pleasure of gaining social status by having nice things <ul style="list-style-type: none"> • pro 	<ol style="list-style-type: none"> 1. the thrill of having more money <ul style="list-style-type: none"> • pro 2. your house loan have given you no problems <ul style="list-style-type: none"> • pro 	<ol style="list-style-type: none"> 1. high interest <ul style="list-style-type: none"> • con 2. easy to get the loan <ul style="list-style-type: none"> • pro 3. you have seen warnings about these types of loans <ul style="list-style-type: none"> • con

EEK analyze table, consumption loans

These pro’s and con’s are a part of our evaluation of having a consumption loan. As I said about smoking, our decision will be based on how many pro’s and con’s there are and how significant they are. When it comes to consumption loans it is not as easy to say that it is stupid to do it, compared with the example about smoking. The trend seems to be that it is often people that have a financial situation that don’t qualify to get a loan with better terms, that is the target area. From that you could argue that many of the people taking these loans are the people that can’t really afford them.

If we start with knowledge we can say that most people have enough knowledge to know that the terms of a consumption loan are poor. There are however difference in how much knowledge we possess about financial instruments. A person who has studied economics may be more aware of the different aspects of such a loan. I think that in the same way as with the smoking the government have a responsibility to make people aware about these things.

When it comes to experience it could vary a lot from person to person. An adult person which have had loans before and know how long it takes and how hard it could be to pay back a loan, have a better possibility to stay critical towards these loans then for instant a student who are in need of money. When it comes to previous generations in Norway they would never finance their consumption with loaned money. The reason for this is that they have experienced a society who had a totally different view on loaning money. In Norway the amount of loan per person has increased much over the last years. This has given young adults of today a whole new experience when it comes to loaning money. Since the brain is an adaptive organ this will be a part of forming our preferences. If the Norwegian economy follows the American economy, and people have to start handing over their houses to the banks because they can't pay their loans, it could change our "experience preferences". If we se that our neighbour is loosing his house, we probably would be more careful. This might be because of the mirror neurons.

Emotions are also a part of deciding whether or not to get a consumption loan. Earlier in this assignment I wrote about an experiment in neuroeconomics that showed that when the subjects in the experiment looked at cars with high social status, there was activity in the rewarding system of the brain. This indicates that we feel positive emotions when we get things with high social status. Very often, these kind of things are what we use consumption loans to buy.

5 The Experiment

This section is about the experiment I have done. The experiment I is a pilot of a experiment that has been done once before by Robert Slonim, James Carlson and Eric Bettinger. The experiment was done to see how humans discount, if they discount exponentially, quasi hyperbolic or hyperbolic. In the experiment they gave the subjects decisions between different amounts of money, and they included two variables, possession and front end delay.

Possession means that the participants got to bring the check home after the experiment, or in the case of no possession they got the check in the mail. Front end delay is that while they hold the discount length constant (two months) they varied the length before the discount period started with 0, 2 and 4 months. In the experiment the subjects got 11 decision sets consisting of 30 questions, the questions you can see in the appendix.

I have previous in this assignment given some mathematical explanation on the different discounting methods. The authors from possession and discounting behaviour introduce some expressions for hyperbolic discounting, and preference reversals. To explain preference reversals they illustrate it like this.

Choice 1: A) $x_t = y$ or B) $x_{t+m} = z$

Choice 2: A') $x_{t+n} = y$ or B') $x_{t+n+m} = z$

If a subject in this case choose A in the first decision and then choose B' in the second decision there is a preference reversal. The reason for that is that in the there is nothing else that changes from A to A' except the front end delay. This is the phenomena “passion for the present” discussed earlier. If the case is that we discount with a higher interest rate when there is no front end delay but exponential otherwise we could call it Quasi – hyperbolic discounting (Laibson, 1997). In the article they present the quasi hyperbolic discount rate like this;

Quasi Hyperbolic: $d_{0,k} = \beta\delta^k \leq d_{s,k+s} = \delta^k \forall_s > 0, k = 1, 2, \dots, \delta \leq 1$

- d = discountfactor.
- s = front end delay
- k = the length of the discount period

If the beta is equal to one we have exponential discounting but if the beta is larger then one we have a passion for the present, and then there is Quasi – hyperbolic discounting. One of the goals with this experiment is to see which of the three discounting methods that gives the best picture of how we discount. We will see that by looking on these predictions about the discounting methods:

- Exponential: $d_{0,2} = d_{2,4} = d_{4,6}$
- Quasi – hyperbolic: $d_{0,2} < d_{2,4} = d_{4,6}$
- Hyperbolic: $d_{0,2} < d_{2,4} < d_{4,6}$

We see for hyperbolic discounting the discount rate will decrease as the front end delay increase, but for Quasi – hyperbolic the discount rate will decrease if there is a front end delay but it will not decrease if the front end delay increase any more. I will later when I'm analysing the result test these three predictions.

In the experiment the other variable is possession. They have put in possession to see if it could eliminate the passion for the present phenomena. Here comes the neuroeconomics part in to the picture. Functional MRI has suggested that reward saliency may influence whether it is the limbic system or the prefrontal cortex that process a decision. By using possession we will try to see if that could weigh up for the fact that the subjects have to wait for the money. I will also come back to this in the analyzing part(Slonim, Betttinger and Carlson, 2007)²¹.

5.1 *The experiment process*

To do this pilot there was a lot of things to figure out. In this section I will tell about the process and the different problems I meet doing this pilot.

Translation

The original experiment was written in English. When I was to do this in Norway all of the material handed out to the subjects that participated in the experiment had to be translated in to Norwegian. It was very important that the translation didn't affect the results. In order to make this happened it was not good enough to translate the material one to one. Instead I had to focus on the message that material sent so that a Norwegian person would get the same associations from the Norwegian text that an English person got from the English text.

My experience in translating these types of documents is almost none existing, so in order to get some sort of quality control I had some people from the university (UiA), who had the experience, to take a look at it. They gave me some different notes that I could use to improve the document.

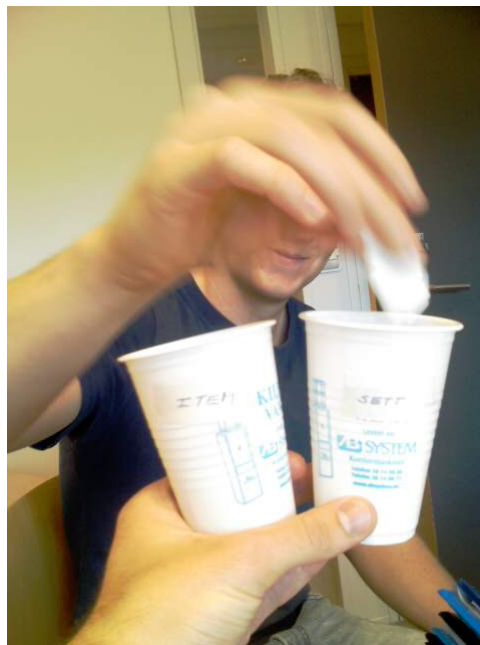
Calculating the cost of the experiment

People that were attending the experiment were paid money. It is always important when you are doing such an experiment that you take the payment to the participants very seriously. You also need to know how much money that the experiment will cost. To get this information you have to do the drawing of payments before the experiment. When you do this you have to make sure that the payments are drawn randomly.



Drawing of Payouts

To do this I wrote down the numbers 1 – 30 on pieces of paper and put in one cup. This numbers represented the questions 1 to 30. In another cup I putted 11 pieces of paper with the numbers 1 – 11 representing the eleven set's of questions. I then had an objective third party to draw up numbers from the two cups. He did this twenty times. Then I had calculated twenty different payouts. Every time my “helper” pulled out a number from the cup we putted it back again. In that way every subject had the possibility to earn every amount. When this was done I could sum up all the payoffs using the worst case scenario principle and see how much money that was needed.



Drawing of Payouts

The participants

I needed twenty participants to do this pilot. In the original experiment they used students, so giving that I did a replication, students was also my first choice. In order to gather twenty students I got an invitation posted on classfronter. Classfronter is a room on the internet where all the students have access and also visit a lot. I wrote in the note that the first twenty students to sign up for this would get in. This plan did not work out at all. When I checked my mail to see how many people that had signed up, there was no response at all. What I then had to do was to go around the school and ask students face to face if they wanted to participate in my experiment. When the experiment started at 11:00 I had gathered 13 people. My goal was twenty subjects but I carried through with the experiment. I also did the experiment on two more subjects later on, so that the total sum became 15 participants.

Place

The experiment took place at a UiA conferences room. The room was big enough for 18 people. Since there only was 13 participants that showed up there was no problem with the size of the room. It was important that the subject wasn't sitting too close, this was to avoid that the subjects would look at each others answer.



Observation during the process

Observations during the experiment

When the subjects arrived the room, where the experiment was taking place, there was a casual atmosphere. Some of the reason for this is that almost all of the subjects knew each other and they also knew me. However when the experiment started everybody was taking the job seriously, and there were no problems. However there were a couple of question regarding the assignment. The questions were connected to the time aspect in the different questions they were answering. On the question sheet the decision problem was written like this:

- 17 _____ valg A: Sende ett gjeldsbrev i posten til deg om 4 måneder pålydende kr. 50, som kan løses inn om 4 måneder
- _____ valg B: Sende ett gjeldsbrev i posten til deg om 6 måneder pålydende kr.60, som kan løses inn om 6 måneder

The questions being asked was if *valg A*, meant that you would receive the *gjeldsbrev* in four months and then had to wait for another four months before you could cash it in. That would mean that you had to wait eight months before receiving any money, and that was not the case. I have no problem with understanding why this question was asked, and this is one of the things that should be improved before doing this experiment on a larger group. I think some of the reason why I didn't see this problem up front was that I had read these decision sheets in English many times and therefore was blinded for the possible miss interpretation of the questions.

Payment to the subjects

One of the most difficult things about performing an experiment that have been done in English and replicating it into Norwegian were the payment tools. In the original experiment they used checks. The positive with checks is that you then have the possibility to write on a due date, and then capture the possession case. In my experiment it was very important that also I captured this variable. The problem was that it was no good to try to use checks, since it is not a familiar payment method in Norway, and it is also expensive because of bank fees. What I did was that I made a contract between the participant of the experiment, me and UiA. This contract is in Norwegian called a *gjeldsbrev* (debtletter). This *gjeldsbrev* stated that I was obligated to pay out the amount of money when the due date came. I think that after some

work I manage to make a contract that gave some of the same associations to the Norwegian participants that a check gave in the original experiment. The difference was that for the participants in my experiment this was a new way of getting paid, this was not the case in the original experiment.

After the experiment was done I told everybody to come over to the reception next to the room we did the experiment in to receive their payments. This was a bigger job than what I thought it would be. To write out the Gjeldsbrev to all of the 13 participants took some time. And if I would do this experiment again I would try to get this part much better organized. There was however one upside of having all of the participants standing in front of me in a line to get paid. When they stood there I could overhear them talking about the experiment. Most of the talking was about the excitement of how much they would get paid, not because it was a large amount of money, but because they were curious. However there was one comment that was very interesting. *One of the participants asked me if I would like to buy the gjeldsbrev he got for 40 NOK.* His gjeldsbrev had a value of 56 NOK that he would receive in four months. This statement does not correlate with his answers in test. In my opinion this indicates that some of the participants answers what they think is theoretically correct and not what they really wants. This is a problem that I think is bigger when you do this kind of experiment on students that study economics. They are schooled in these types of question, and it is therefore more difficult to know if they answer what they really wants or what they have learned is correct.

5.3 Analysing of the material from the experiment

In this section I will analyze the material I have from the experiment. I will start with explaining what the different variables stands for.

S1	= Sett 1	discount period	$d_{2,4}$	possession	NO
S2	= Sett 2	discount period	$d_{4,6}$	possession	NO
S3	= Sett 3	discount period	$d_{0,2}$	possession	NO
S4	= Sett 4	discount period	$d_{0,2}$	possession	YES
S5	= Sett 5	discount period	$d_{2,4}$	possession	YES
S6	= Sett 6	discount period	$d_{4,6}$	possession	YES

The discount period $d_{x,y}$ tells us that the discount period starts after x months and stops after y months. Possession tells us whether or not the subject in the experiment gets the gjeldsbrev right away or if he gets it in the mail. So in variable S1, ..., S6 it is possession and front end delay that varies.

S7	= Sett 7	discount period	$d_{2,2}$	possession	YES and NO
S8	= Sett 8	discount period	$d_{3 \text{ days}, 3 \text{ days}}$	possession	YES and NO

These two sets are possession question. The only difference is possession or no possession.

S9	= Sett 9	discount period	$d_{2,6}$	possession	NO
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Here it is a longer discount period then in set S1, ... , S6. (four months).

S10	= Sett 10	discount period	$d_{0,0}$	possession	YES
-----	-----------	-----------------	-----------	------------	-----

In S10 there is a question if you prefer cash or gjeldsbrev.

S11	= Sett 11	discount period	$d_{0,4}$	possession	NO
-----	-----------	-----------------	-----------	------------	----

Here it is the same case as for S9 except that there is no front end delay.

DF: = Days of vacation
 AGE = Age of the participant
 GEN = Gender of the participant
 1 = female
 0 = man
 EDU
 1 = economy
 0 = other
 DUR = how far the participant is in his or hers education
 0 = below master level
 1 = first year master
 2 = second year master
 3 = finished with their education
 GRADE = Grade average, high school
 HEGRADE = Grade average, higher education

Demographics of the participants:

In my experiment I had some questions that were mapping the demographics of the participants. In the table below I have listed up the mean of these demographical questions. To get these numbers I used the summarize function in STATA;

```
. sum AGE GEN EDU DUR GRADE HEGRADE,d
```

	Variables					
	AGE	GEN	EDU	DUR	GRADE	HEGRADE
Mean	24,53	0,27	0,8	1,67	4,68	2,25
Std. dev	1,92	0,46	0,41	0,90	0,46	0,38

This is the demographics for the participants in this pilot. As we can see the average age is 24,53 and there was 27 % females that attended this experiment. 80 % of the participants was studying economics and the average duration was in between the first and second year of the master level. The grade average from high school was 4,68 and the average on their higher education was 2.25. 2,25 is between C and B, but closer to B than C. I will use this demographics later when I'm going to analyse the results of the experiment.

The discounting results from the experiment

I will in this sections start by looking at the factors S1,...,S6. These factors have front end delay and possession. Possession is ether YES or NO, and front end delay is zero, two and four months. Each of the factors, S1,...,S6, consists of 15 observations, the observations look like this:

S4									
1.	80	6.	51	11.	51.5				
2.	52	7.	60	12.	54				
3.	100	8.	50.5	13.	53				
4.	53.5	9.	57	14.	100				
5.	100	10.	59	15.	80				

This is the result from “sett 4”. The amounts illustrate how much the subjects have to get before they are willing to wait two months before getting them. The amount they are discounting is 50 NOK. This means that subject 1 have to get 30 NOK before he is willing to wait two months before getting the money.

When I’m analyzing these data I will also give the amounts in percent by dividing the results on 50.

Subject one will in this case have a two months discount rate on;

$$80/50 = 1.6$$

I have crated these variables in STATA by using the command;

$$\text{gen int1} = (\text{S1}/50)$$

. sum S1 S2 S3 S4 S5 S6 int1 int2 int3 int4 int5 int6

Variable	Obs	Mean	Std. Dev.	Min	Max
S1	14	64.5	16.90471	50.5	100
S2	14	65.25	19.40931	50.5	100
S3	14	65.10714	17.77766	50.5	100
S4	15	66.76667	19.56296	50.5	100
S5	15	61.96667	17.05816	50.5	100
S6	15	61.7	17.14726	50.5	100

Stata Table

In this table we then have the discount rates given by int1,.....,int6. The discounts rate can be divided into these groups;

front end delay	Possession	
	YES	NO
0 months	1.30	1.34
2 months	1.29	1.24
4 months	1.31	1.23

Means, front end delay and Possession

One of the things I want to find out with doing this experiment is to see if we tend to discount hyperbolic, Quasi hyperbolic or exponential. Earlier I wrote the assumptions about these discounting methods;

1. Exponential: $d_{0,2} = d_{2,4} = d_{4,6}$
2. Quasi – hyperbolic: $d_{0,2} < d_{2,4} = d_{4,6}$
3. Hyperbolic: $d_{0,2} < d_{2,4} < d_{4,6}$

To test these assumption for each of the discounting methods I will first present the data I need into these model, and I will now use the variables int1,.....,int6

	t-value	Std error	df	Conf. interval 95%	
Int1	14,28	0,090	13	1,095	1,485
Int2	12,58	0,104	13	1,081	1,529
Int3	13,70	0,095	13	1,097	1,507
Int4	13,22	0,101	14	1,119	1,552
Int5	14,07	0,088	14	1,050	1,428
Int6	13,94	0,089	14	1,044	1,424

Stata Results

In order to see if assumption 1,2 and 3 are true we have to know what variables that belong together.

	Front end delay	Possession
int1	2	NO
int2	4	NO
int3	0	NO
int4	0	YES
int5	2	YES
int6	4	YES

We can then write assumption 1,2 and 3 as;

		No Possession	or	possession
1.	Exponential:	$int3 = int1 = int2$		$int4 = int5 = int6$
2.	Quasi – hyperbolic:	$int3 < int1 = int2$		$int4 < int5 = int6$
3.	Hyperbolic:	$int3 < int1 < int2$		$int4 < int5 < int6$

I will test these hypotheses both in the possession and no possession case. I will start with the no possession case.

You can test these assumptions both by looking on the confidence intervals and doing a T – test. When I’m doing the T-test I get the T-value from Stata, and I compare it to T – critical which I can get from a T – statistics table.

On this page I will just go through some of the formulas to get the values that I need in my analyze

$$st.error = \frac{\sigma}{\sqrt{N}}$$

- *Standard error is the standard deviation of the sample average*

The standard error for int1;

$$= 0,338/\sqrt{14}$$

$$= 0,090$$

$$t = \frac{mean}{\sigma/\sqrt{N}}$$

T – value for int1 is;

$$= \frac{1,29}{0,338/\sqrt{14}}$$

$$= 14,28$$

Confidence interval

$$mean \pm t_c \times st.error$$

Int1 will then have the confidence interval

$$= 1,29 \pm 2,160 \times 0,90$$

$$= 1,0956 \quad \text{and} \quad 1,4844$$

The t critical value is for a 95% confidence interval, and there is 13 degrees of freedom.

Front end delay

If there is a significant effect on the discount rate from the variable front end delay we can argue that there is not exponential discounting. I will test the effect of front end delay both when possession is included and when it's not included.

No Possession

- $H_0 = \text{int3} = \text{int1} = \text{int2}$ (exponential discounting)
 $H_a = \text{int3} \neq \text{int1} \neq \text{int2}$ (not exponential)

We reject H_0 if the confidence intervals are overlapping.

	Conf. interval 95%	
Int1	1,095	1,485
Int2	1,081	1,529
Int3	1,097	1,507

Confidence intervals front end delay no possession

We see from these confidence intervals that they are overlapping each other. We can then not reject H_0 .

Possession

- $H_0 = \text{int4} = \text{int5} = \text{int6}$ (exponential discounting)
 $H_a = \text{int4} \neq \text{int5} \neq \text{int6}$ (not exponential)

We reject H_0 if the confidence intervals are overlapping.

	Conf. interval 95%	
Int4	1,119	1,552
Int5	1,050	1,428
Int6	1,044	1,424

Confidence intervals front end delay possession

We can not reject H_0 .

Testing the effect of possession

The sets S7 and S8 are possession question. In this case there is no discounting over time. It is just a question of how much money you need to give up your possession. I will in this analyze crate two new variables cost7 and cost8.

Stata command: `gen cost8 = (S8-50)`

Then we will se how many NOK the subjects need in order to give up their possession.

	Mean	t-value	Std error	St deviation	df	Conf. interval 95%	
cost7	-22,92	-1,68	13,633	52,80	14	-52,156	6.323
cost 7 if cost7>-50	0,35	2,20	0,161	0,56	11	-0,001	0,709
cost8	3,8	1,70	2,231	8,64	14	-0,984	8,584
Cost8 if cost8<25	0,54	2,42	0,223	0,80	12	0,053	1,023

Results Possession

To make the names of the variables a little shorter I'm renaming cost 7 if cost7>-50 to cost7' and Cost8 if cost8<25 to cost8'

In this table I have made two variables called cost 7' and cost 8'. The reason I have done that is that there is some observations that are much higher and lower then the rest. Since this is a type of experiment that involves many questions it is reasonable to think that some of these observations could be a subject that simply has marked a question in another way than what

he or she actually was meaning. I will however also take these observations into consideration when I'm making a conclusion for the experiment.

In this possession scenario there are two things that I'm going to test. The first one is if cost7' and cost8' are significantly different then 0. And if cost7' and cost8' are significantly different from each other.

To see if the two variables are significantly different from zero I will use a T-test. I can then use the T-values that are in the table, and compare them to the T-critical values.

The T-critical values are;

			<i>T-value from the table</i>
cost7' = 5% and 11 degrees of freedom	=	2,201	2,20
cost8' = 5% and 12 degrees of freedom	=	2,179	2,42

Hypotheses

$$3. \quad \begin{array}{l} H_0 = \text{cost7}' = 0 \\ H_a = \text{cost7}' \neq 0 \end{array} \quad \text{reject if } T_{\text{cost7}'} > T_{\text{critical}}$$

$$4. \quad \begin{array}{l} H_0 = \text{cost8}' = 0 \\ H_a = \text{cost7}' \neq 0 \end{array} \quad \text{reject if } T_{\text{cost8}'} > T_{\text{critical}}$$

$$5. \quad \begin{array}{l} H_0 = \text{cost7}' = \text{cost8}' \\ H_a = \text{cost7}' \neq \text{cost8}' \end{array} \quad \text{reject if the confidence intervals are overlapping each other}$$

$$3. \quad T_{\text{cost7}'} < T_{\text{critical}}$$

We can not reject H_0 for cost7'.

We also see this from the Conf. interval 95%, (-0,001 0,709)

$$4. \quad T_{\text{cost8}'} > T_{\text{critical}}$$

We reject H_0 for cost8'.

Conf. interval 95%, (0,053 1,023)

4. From the confidence intervals in the table we see that we can not say that cost8' is significantly different than cost7'.

Cash or Gjeldsbrev

The variable S10 describe if the participants in the experiment prefer cash or gjeldsbrev as payment. To analyze this I'm going to generate the same type of variable as I did for S7 and S8;

$$\text{gen cost10}=(\text{S10} - 50)$$

I will use confidence intervals to find out if cost10 or cost10' (cost10 if cost10<25) are significantly larger than zero.

6. $H_0 = \text{cost10}' = 0$ reject if the confidence interval includes 0.
 $H_a = \text{cost10}' \neq 0$

	95% Conf. Interval		Std.Error
cost10	-1,901	13,367	3,559
cost10'	0,082	1,610	0,351

We see from the confidence intervals that cost10 is not significantly different from zero, which means that the subjects didn't find it significantly better to get paid in cash than with Gjeldsbrev. We reject H_0 . The variable cost10' is significantly different (larger) than zero, so when I removed the observations larger than 25 it became significant. The reason is reflected in the std. error, it has become much lower when the high observations were removed.

Four months discount period

The two last variables, S9 and S11 are no possession scenarios with front end delay at 0 and two months. The discount period has increased to four months. According to the exponential discounting theory the discount factor should stay constant independent of how long the discount period is. I will in this section hold front end delay constant and see what happens to the discount rate when the discount period increases.

S11 = front end delay 0 months = S3

S9 = front end delay 2 months = S2

I will also in this section change the variables into percent, so I generate two new variables, int9 and int11

	Mean	t-value	Std error	St deviation	df	Conf. interval 95%	
Int9	1,369	10.04	0,136	0,528	14	1.077	1.662
Int11	1,284	4,39	0,292	1,132	14	0,657	1.911
Int2	1,305	12,58	0,104	0,388	13	1,081	1,529
Int3	1,302	13,70	0,095	0,356	13	1,097	1,507

Results four months discount period

7. $H_0 = \text{int11} = \text{int3}$ reject if confidence intervals are
 $H_a = \text{int11} \neq \text{int3}$ overlapping

We can not reject H_0

8. $H_0 = \text{int9} = \text{int2}$ reject if confidence intervals are
 $H_a = \text{int9} \neq \text{int2}$ overlapping

We can not reject H_0

We see from the confidence intervals in this table that int9 is not significantly different from int2, and int11 is not significantly different from int3.

Results

This is a sum up of the results from the analyzing

- | | | | |
|----|---------|---|----------------------|
| 1. | $H_0 =$ | $\text{int3} = \text{int1} = \text{int2}$ | can not reject H_0 |
| 2. | $H_0 =$ | $\text{int4} = \text{int5} = \text{int6}$ | can not reject H_0 |
| 3. | $H_0 =$ | $\text{cost7}' = 0$ | can not reject H_0 |
| 4. | $H_0 =$ | $\text{cost8}' = 0$ | reject H_0 |
| 5. | $H_0 =$ | $\text{cost7}' = \text{cost8}'$ | can not reject H_0 |
| 6. | $H_0 =$ | $\text{cost10}' = 0$ | can not reject H_0 |
| 7. | $H_0 =$ | $\text{int11} = \text{int3}$ | can not reject H_0 |
| 8. | $H_0 =$ | $\text{int9} = \text{int2}$ | can not reject H_0 |

I once more have to point out that I only had 15 participants in this experiment and therefore there is no point in over analyzing these numbers, my analyze is therefore very simple. I have also just tested on a 5% significance level, and have also just looked at the confidence intervals and some T – values to get my results. I don't think that there is any point in analyzing the results more detailed then this. But I will give a very brief explanation of the results 1- 8.

1. The subjects are discounting exponentially with no possession
2. The subjects are discounting exponentially with possession
3. The subjects can not be said to prefer possession over no possession
4. The subjects can not be said to prefer possession over no possession
5. The subject doesn't prefer possession higher with when there is a long front end delay
Then when there is a short front en delay.
6. The subjects don't care if they get money or gjeldsbrev
7. The discount rate does not change when the discount period increase
8. The discount rate does not change when the discount period increase

6 Conclusion

I have through this assignment illustrated how neuroeconomics can contribute to explain human behaviour and then especially discounting behaviour. There is no doubt that many of the points that are being made are informative and give more depth to explaining why we act in the way that we do.

We humans don't discount exponentially in every discounting decision that we make and there is neither any doubt that we act irrational in many situations. Although much of the material that is being provided from neuroscience is helpful to give explanation to why these things happen, I will not say that neuroeconomics has the answer to how we can form perfect economic models, at least not at this point. When I have read articles about neuroeconomics I sometimes get the feeling that they criticise the old economic models too much. The way I see it is a big difference in a model that is supposed to predict behaviour and a model that tries to tell us how to steer the economy. By this I mean that many of the economic models that exist fulfil their purpose, and that sometimes neuroeconomics go out criticising too hard.

There are however some areas that I feel neuroeconomics have a lot to offer when it comes to discounting. One of these things is the explanation of preference reversals. That there is reason to believe that many humans have a passion for the present and that these things influence the way we discount seems natural to me, and on this subject neuroeconomics has come with some good explanations. I think it is very important that we know about these things. That makes us able to give a better prediction on how humans will behave. Like when I talked about credit cards it is important to know that you have to assume that many people will get in trouble by taking these loans. You can not in these situations assume that people will act in the smartest way, since we have this passion for the present.

In the experiment that I did my results said that we could not reject the hypothesis that people were discounting exponentially. However this was a pilot and I did not have enough participants to get any valid conclusions from this experiment. My experiment had these three hypotheses;

1. Exponential: $d_{0,2} = d_{2,4} = d_{4,6}$
2. Quasi – hyperbolic: $d_{0,2} < d_{2,4} = d_{4,6}$
3. Hyperbolic: $d_{0,2} < d_{2,4} < d_{4,6}$

I think that the quasi hyperbolic discounting method gives the best overall explanation on how we tend to discount in many situations. The reason for this is that if you look around you in how we make our decisions you can see so many examples where it exists a passion for the present. But if you insert a front end delay it will after a certain point go back to exponential discounting.

The results that I got from the pilot may not tell us too much. I did however get some interesting result from the process of doing it. The type of experiment that I did is probably not the best type of experiment to perform on economic students. As I said I got the feeling that they were giving the text book answer instead of what they really wanted. This should be changed before doing this experiment in full scale. The translation part should also be done very carefully, even though I tried hard translating these questions and even checked it with other persons at the university there was some questions from the participants.

When I developed my EEK framework I tried to use a simplifying of the theory that I got from neuroeconomics to create a analyze tool. To have such a framework can come in handy in many situations. I think it is important to understand that it is our preferences that make the decisions for how we will behave. To have the knowledge on how these preferences can be formed and changed can contribute in many ways. We looked at an example that was about what types of commercials that had best effect on us. To actually be able to give physiological answers to questions like this is a step forward. So I think that in marketing the knowledge about neuroeconomics can be very useful.

7 References

<http://www.radiologyinfo.org/en/info.cfm?pg=PET&bhcp=1>

² Neuroeconomics studies, 2007 , Paul Zack

³ http://www.c-nbh.com/meg_eng.htm

⁴ <http://biology.about.com/library/organs/brain/blfrontallobe.htm>

⁵ <http://webspace.ship.edu/cgboer/limbicsystem.html>

⁶ <http://webspace.ship.edu/cgboer/limbicsystem.html>

⁷ <http://webspace.ship.edu/cgboer/limbicsystem.html>

⁸ Arild Sæther, 1994, Mikroøkonomi

⁹ Jang Woo Park, Paul J. Zack, 2007, Neuroeconomics Studies

¹⁰ Sven Braeutigam, 2005, Neuroeconomics – From neural systems to economic behaviour

¹¹ Sven Braeutigam, 2005, Neuroeconomics – From neural systems to economic behaviour

¹² S. Erk, 2002, Cultural objects modulates reward circuitry

¹³ Giacomo Rizzolatti, Corrado Sinigaglia, 2007, Mirror neurons and motor intentionality

¹⁴ David Hume, 2005, neuroeconomics: Present and future

¹⁵ Jang Woo Park, Paul J. Zack, 2007, Neuroeconomics Studies

¹⁶ Jang Woo Park, Paul J. Zack, 2007, Neuroeconomics Studies

¹⁷ Ernst Fehr, Urs Fischbacher, Michael Kosfeld, 2005, Neuroeconomics Foundations of Trust and Social Preferences: Initial Evidence.

¹⁸ <http://www.sosmath.com/trig/hyper/hyper01/hyper01.html>

¹⁹ Golden Eggs and Hyperbolic discounting, David Laisson 2004

²⁰ www.citibank.no

²¹ Robert Slonim, James Carlson and Eric Bettinger, Possession and discounting behaviour, 2007

Appendix

The question sheet from the experiment

Introduksjon

Takk for at du har valgt å delta i dag. I tillegg til betalingen på 25 kroner for å delta, vil du få muligheten til å tjene mer, muligens i form av et gjeldsbrev eller kontanter, avhenging av hvordan du svarer på de påfølgende spørsmål. Vi regner med at dette vil ta ca 45 minutter. I konvolutten dere har fått ligger alle instruksjonene og spørsmåls ark, og i tillegg en undersøkelse. Dere avgjør selv hvor fort dere vil svare på spørsmålene. Pass på at du leser instruksjonene nøye, de vil forklare hvordan svarene du gir vil påvirke hvor mye du tjener.

Alt materiell du trenger for dette eksperimentet ligger i mappen du har fått utdelt. Etter du har lest instruksjonene kan du starte. Når du begynner bør du ta ut og gjøre ferdig ett og ett spørsmåls ark. Legg også merke til at det er spørsmål både på forsiden og baksiden av arkene, pass på å få svart på begge sidene. Dere har også fått en tom konvolutt, denne skal brukes til å legge ferdig svarte spørsmålsark i, ikke gå tilbake og se på disse etter at arkene er blitt lagt i den tomme konvolutten.

Når du holder på med spørsmålssidene kan du ha instruksjonene fremme og se på disse til enhver tid. Når du er ferdig med spørsmålene og undersøkelsen, rekk opp hånden og si i fra om at du er ferdig. En av veilederne vil da komme å hjelpe deg med å ferdigstille eksperimentet og bestemme hvor stor belønningen din vil bli. Alle vil svare litt forskjellig på spørsmålene og vi ber om at dere ikke kikker på andre underveis, og at dere heller ikke lar noen kikke på dere.

Ikke nøl med å stille spørsmål underveis. Rekk opp hånden og en av veilederne vil komme og hjelpe deg.

Fortsett å lese den neste siden, den gir instruksjonene for den første oppgaven.

Instruksjoner for oppgave 1

(1) Overblikk

Du vil få elleve spørsmåls ark. Vi kaller hvert spørsmålsark for et "Sett". På hver side vil du avgi flere svar. For hvert spørsmål vil du alltid ha to valg. Du må velge ett av disse to valgene. Hvis du velger begge eller ingen av valgene kan du ikke få betalt for dette spørsmålet. Pass på og kun krysse av for ett av de to alternativene. Og husk, det er ikke noen riktige eller gale svar. Vi er kun interessert i hvilket av de to valgene du foretrekker.

Når du har svart på alle spørsmålene vil det komme en kort undersøkelse. Når dere har gjort denne undersøkelsen kommer vi til å trekke ut ett tilfeldig "sett" og ett tilfeldig spørsmål fra dette "settet", og du vil få utbetalt det du har valgt på dette spørsmålet. Siden du ikke vet hvilket av spørsmålene du vil få betalt for ber vi deg om å svare på alle spørsmålene som om det var det spørsmålet du fikk betalt for.

(2) viktig informasjon

Hvis vi skriver

Ett gjeldsbrev som kan løses inn i dag

Ett gjeldsbrev som kan løses inn om tre dager

Ett gjeldsbrev som kan løses inn om X måneder

Sende til deg i dag i posten

Sende til deg om X måneder

Motta i dag

Da mener vi

At man i dag kan sende inn KontoNr. på e-post å få pengene inn på konto

At man om tre dager kan sende KontoNr. på e-post å få pengene inn på konto

At man om X måneder kan sende KontoNr. på e-post å få pengene inn på konto

Vi vil putte gjeldsbrevet i posten senere i dag

Vi vil putte gjeldsbrevet i posten om nøyaktig X måneder

Du vil mota gjeldsbrevet på slutten av dette eksperimentet

Hvis du får betalingen i posten

Hvis du skal få betalt per post må du skrive ned adressen din på en konvolutt før du drar. Denne konvolutten vil da bli plassert i en låst skuff hos oss inntil den dagen den blir sendt i posten. Din adresse blir holdt konfidensielt, og det er kun den forsøksansvarlige som vil ha tilgang til den låste skuffen.

(3) Konfidensialitet

Alle svarene dine blir holdt konfidensielt. Vi oppfordrer igjen til at du under denne øvelsen ikke prøver og se på hva de andre svare, og at du prøver å forhindre at noen ser på deg.

(4) Prosedyre

Du går gjennom spørsmålene i det tempoet du selv ønsker. Husk å kun ta ut ett ark om gangen fra konvolutten. Når du har ferdigstilt et "sett", putt dette inn i konvolutten for ferdigstilte spørsmåls ark og fortsett så på neste sett. Hvis du på noe punkt i øvelsen skulle ha spørsmål, rekk opp hånden og vi vil hjelpe deg så fort vi kan. Du kan ha disse instruksjonene framme under hele eksperimentet i tilfelle du ønsker å se gjennom dem en gang til under eksperimentet.

Dette var instruksene for oppgave 1. Husk at dere på hvert av spørsmålene kun skal krysse av for ett av alternativene. Ta frem første spørsmåls ark og sett i gang.

Sett 4

Merk av med X for det alternativet du ønsker og velge.

Spørsmål

- 1 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 45, som kan løses inn om 2 måneder
- 2 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
- 3 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50,5, som kan løses inn om 2 måneder
- 4 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51, som kan løses inn om 2 måneder
- 5 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51,5, som kan løses inn om 2 måneder
- 6 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52, som kan løses inn om 2 måneder
- 7 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52,5, som kan løses inn om 2 måneder
- 8 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53, som kan løses inn om 2 måneder
- 9 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53,5, som kan løses inn om 2 måneder
- 10 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54, som kan løses inn om 2 måneder
- 11 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54,5, som kan løses inn om 2 måneder
- 12 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 55, som kan løses inn om 2 måneder
- 13 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 56, som kan løses inn om 2 måneder
- 14 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 57, som kan løses inn om 2 måneder
- 15 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 58, som kan løses inn om 2 måneder

Sett 5

Merk av med X for det alternativet du ønsker og velge.

Spørsmål

- 1 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 45, som kan løses inn om 4 måneder
- 2 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
- 3 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50,5, som kan løses inn om 4 måneder
- 4 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51, som kan løses inn om 4 måneder
- 5 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51,5, som kan løses inn om 4 måneder
- 6 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52, som kan løses inn om 4 måneder
- 7 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52,5, som kan løses inn om 4 måneder
- 8 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53, som kan løses inn om 4 måneder
- 9 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53,5, som kan løses inn om 4 måneder
- 10 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54, som kan løses inn om 4 måneder
- 11 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54,5, som kan løses inn om 4 måneder
- 12 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 55, som kan løses inn om 4 måneder
- 13 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 56, som kan løses inn om 4 måneder
- 14 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 57, som kan løses inn om 4 måneder
- 15 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 58, som kan løses inn om 4 måneder

Sett 6

Merk av med X for det alternativet du ønsker og velge.

Spørsmål

- 1 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 45, som kan løses inn om 6 måneder
- 2 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 6 måneder
- 3 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50,5, som kan løses inn om 6 måneder
- 4 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51, som kan løses inn om 6 måneder
- 5 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51,5, som kan løses inn om 6 måneder
- 6 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52, som kan løses inn om 6 måneder
- 7 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52,5, som kan løses inn om 6 måneder
- 8 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53, som kan løses inn om 6 måneder
- 9 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53,5, som kan løses inn om 6 måneder
- 10 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54, som kan løses inn om 6 måneder
- 11 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54,5, som kan løses inn om 6 måneder
- 12 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 55, som kan løses inn om 6 måneder
- 13 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 56, som kan løses inn om 6 måneder
- 14 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 57, som kan løses inn om 6 måneder
- 15 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 4 måneder
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 58, som kan løses inn om 6 måneder

Sett 7**Merk av med X for det alternativet du ønsker og velge.****Spørsmål**

- 1 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 40, som kan løses inn om 2 måneder
- 2 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 42,5, som kan løses inn om 2 måneder
- 3 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 45, som kan løses inn om 2 måneder
- 4 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 46, som kan løses inn om 2 måneder
- 5 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 46,5, som kan løses inn om 2 måneder
- 6 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 47, som kan løses inn om 2 måneder
- 7 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 47,5, som kan løses inn om 2 måneder
- 8 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 48, som kan løses inn om 2 måneder
- 9 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 48,5, som kan løses inn om 2 måneder
- 10 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 48,75, som kan løses inn om 2 måneder
- 11 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 49, som kan løses inn om 2 måneder
- 12 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 49,25, som kan løses inn om 2 måneder
- 13 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 49,50, som kan løses inn om 2 måneder
- 14 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 49,75, som kan løses inn om 2 måneder
- 15 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder
 _____ valg B: Sender til deg om 2 måneder ett gjeldsbrev pålydende kr. 50, som kan løses inn om 2 måneder

Sett 8

Merk av med X for det alternativet du ønsker og velge.

Spørsmål

- 1 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 40, som kan løses inn om 3 dager
- 2 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 42,5, som kan løses inn om 3 dager
- 3 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 45, som kan løses inn om 3 dager
- 4 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 46, som kan løses inn om 3 dager
- 5 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 46,5, som kan løses inn om 3 dager
- 6 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 47, som kan løses inn om 3 dager
- 7 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 47,5, som kan løses inn om 3 dager
- 8 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 48, som kan løses inn om 3 dager
- 9 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 48,5, som kan løses inn om 3 dager
- 10 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 48,75, som kan løses inn om 3 dager
- 11 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 49, som kan løses inn om 3 dager
- 12 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 49,25, som kan løses inn om 3 dager
- 13 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 49,5, som kan løses inn om 3 dager
- 14 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 49,75, som kan løses inn om 3 dager
- 15 _____ valg A: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager
 _____ valg B: Sender til deg om 3 dager ett gjeldsbrev pålydende kr. 50, som kan løses inn om 3 dager

Sett 10

Merk av med X for det alternativet du ønsker og velge.

Spørsmål

- 1 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 45, som kan løses inn i dag
- 2 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50, som kan løses inn i dag
- 3 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 50,5, som kan løses inn i dag
- 4 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51, som kan løses inn i dag
- 5 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 51,5, som kan løses inn i dag
- 6 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52, som kan løses inn i dag
- 7 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 52,5, som kan løses inn i dag
- 8 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53, som kan løses inn i dag
- 9 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 53,5, som kan løses inn i dag
- 10 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54, som kan løses inn i dag
- 11 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 54,5, som kan løses inn i dag
- 12 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 55, som kan løses inn i dag
- 13 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 56, som kan løses inn i dag
- 14 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 57, som kan løses inn i dag
- 15 _____ valg A: Mota i dag kr 50 i kontanter
 _____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 58, som kan løses inn i dag

-
- 16 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 59, som kan løses inn i dag
- 17 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 60, som kan løses inn i dag
- 18 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 61, som kan løses inn i dag
- 19 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 62, som kan løses inn i dag
- 20 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 63, som kan løses inn i dag
- 21 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 64, som kan løses inn i dag
- 22 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 65, som kan løses inn i dag
- 23 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 67, som kan løses inn i dag
- 24 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 69, som kan løses inn i dag
- 25 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 71, som kan løses inn i dag
- 26 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 73, som kan løses inn i dag
- 27 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 75, som kan løses inn i dag
- 28 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 80, som kan løses inn i dag
- 29 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 100, som kan løses inn i dag
- 30 _____ valg A: Mota i dag kr 50 i kontanter
_____ valg B: Få i hånden ett gjeldsbrev pålydende kr. 150, som kan løses inn i dag

Undersøkelse

Takk igjen for at dere har valgt og delta på dette eksperimentet. Dere har nå fullført oppgave 1 og 2. Pass på og putt instruksjons papirene tilbake i ”ferdige spørsmåls ark” mappen. For å fullføre dette eksperimentet vil vi gjerne at dere svarer på de påfølgende spørsmålene. Minner igjen på at alt dere svarer her vil bli holdt konfidensielt. Når dere er ferdige, rekk opphånden og vi vil komme bort til deg, og sørge for at du får betalt det du skal ha.

(1) Ring rundt JA eller NEI på disse spørsmålene

Har du kjøpt bil av en privat person de siste fem årene	JA	NEI
Har du hatt en kolesterol test de siste fem årene	JA	NEI
Har du sjekket blodtrykket dit de siste fem årene	JA	NEI
Røyker du	JA	NEI
Bruker du bilbelte mesteparten av tiden	JA	NEI
Brukte du tanntråd i går	JA	NEI
Pusset du tennene mer enn en gang i går	JA	NEI
Trener du regelmessig	JA	NEI

(2) Ta og vurder sannsynligheten for at du ville deltatt på aktivitetene. Husk at det her ikke er noe rett og galt svar. Hvis du er i tvil svar det, magefølelsen din sier deg.

Utsagn	høyst usannsynlig	usannsynlig	vet ikke	sannsynlig	høyst sannsynlig
Innrømme at du har annerledes smak enn vennene dine					
Krangle med en venn som mener det motsatte av deg					
Spørre sjefen din om lønnsforhøyelse					
Satse en dags lønn på et hesteløp					
Kjøre narkotika til eget forbruk					
Følge etter en tornado i bil for å ta bilder du kan selge					

Jukse med inntekts skatten din					
Jukse på en eksamen					
Stå som kausjonist for en venn på et bil lån					
Date noen fra jobben din					
Dele leiligheten med en du ikke kjenner godt					
Si i mot din far på et viktig tema					
Kjøre bil hjem etter du har hatt tre drinker den siste timen					
Spise mat som har gått ut på dato, men som ser ok ut					
Utforske nye byer eller nye deler av byer					
Forfalske noen sin signatur					
Drikke alkohol regelmessig					
Kjøre ned en ski løype som er for vanskelig eller stengt					
Dra på Safari i Kenya					
Dra på en to ukers ferie til utlandet uten og ha reservasjoner på forhånd					
Dra på rafting når elven er på sitt mest ekstreme					
Overse en psykisk lidelse ved å ikke gå til doktoren					
Ulovelig kopiere Software					
Ta medisiner som kan ha negative bivirkninger					
Reise med ett kommersielt fly					
Skrive av en skole oppgave					
Ha ubeskyttet sex					
Investere 10% av inntekten din i en lav risiko aksje					
Investere 10% av inntekten din i en høy risiko aksje					
Investere 10% av inntekten din i stats obligasjoner					
Investere i et firma som det er store sjangser for vil feile					
Låne en venn en sum penger som tilsvarer en månedes lønn					
Flytte til en ny by					
Aldri bruke solkrem når du soler deg					
Aldri bruke bilbelte					
Ikke ha brannalarm i eller utenfor soverommet ditt					
Si deg uenig med sjefen din forran dine medarbeidere					
Delta i farlige sporter (fjell klatring, fallskjerm hopping osv.)					
Utsagn	høyst usannsynlig	usannsynlig	vet ikke	sannsynlig	høyst sannsynlig
Regelmessig sykle uten hjelm					
Stjele en liten gjenstand (en penn, lipgloss osv.)					
Røyke en pakke med sigaretter per dag					
Si din mening om et upopulert tema på en sosial tilsetning					
Bruke penger impulsivt uten og tenke på konsekvensene					
Stjele Tv Signaler					
Ta en dagslønn til å bruke på spilleautomater					

Ta en jobb hvor lønnen din kun er bonus basert					
Prøve og hoppe i strikk					
Ta kontorrekvisitta til privat forbruk					
Bruke utradisjonelle klær					

1. Alle mennesker må ta viktige avgjørelser i løpet av livet. Hvis du må ta en slik avgjørelse, i hvor stor grad ser du da for deg konsekvensene av avgjørelsen din på forhånd?

- a) Ingenting
- b) Lite
- c) Noe
- d) Nesten alt
- e) Alt

2. Etter du har tatt avgjørelsen, pleier konsekvensene av avgjørelsen å bli slik du forestilte deg på forhånd?

- a) Det stemmer nesten alltid
- b) Det stemmer ganske ofte
- c) Det stemmer ca 50 prosent av gangene
- d) Det stemmer en sjelden gang
- e) Det stemmer nesten aldri

3. En avgjørelse du tar nesten hver dag, enten du tror det eller ikke, er hvor mye du velger og studere. Når du tar denne avgjørelsen om hvor mye du vil studere, *hvor ofte tenker du på hvordan studeringen vil:*

	Aldri	Sjeldent	Av og til	Ofte	Alltid
Forbedre karakterene dine?					
Forbedre sjansene dine til å få en bra jobb?					
Forbedre sjansene dine til å tjene mer penger?					
Forbedre sjansene dine til å bli mer lykkelig?					
Forbedre sjansene dine til å få et bedre liv?					
Forbedre sjansene dine til å leve lengere?					

4. Tenk deg at vinner en 10 dagers ferie tur til et spennende feriemål. For å spre ut når folk drar på turen blir du spurt om du kan utsette turen din i tre år i bytte mot en lengre ferie. Hvor mange dager ekstra ferie skulle du hatt for å være villig til å utsette ferien i tre år?

Ekstra ferie dager? _____

(3) Og til slutt noen spørsmål om deg selv

Alder: _____

Du er: Mann Kvinne

Din Mastergrad spesialisering er: _____

Hvor langt har du kommet i utdanningen: 1 år master 2 år master Ferdig

Hvor bor du: _____

Om du husker, hva var karakter gjennomsnittet du hadde på videregående:

Om du husker, hvordan gjennom snitt hadde/har du på din utdannelse etter videregående:

Gjeldsbrev

Undertegnede

Jochen Jungeilges
Universitet i agder
Serviceboks 422
4604 KRISTIANSAND

og

Joakim Hanssen
Rathkes gate 6
0558 OSLO

Erkjenner å skylde

Navn:

Adresse:

Kr. _____

Det påløper ikke renter på beløpet.

Beløpet skal utbetales etter: Dato: _____¹

For at beløpet skal bli utbetales må konto nummer sendes til:

Jochen.jungeilges@uia.no, etter overnevnte dato¹.

Gjeldsbrevet er kun gyldig en uke etter overnevnte dato¹

Sted: Kristiansand (UIA)

Dato: 22.05.2008

Signatur Utbetaler (debitor):

Signatur vitne 1
