S1 Instructions for the market experiment (originally in German)

Welcome to this experiment. Please cease any communication with other participants, switch off your mobiles, and read these instructions carefully. If you have any questions, please raise your hand. An experimenter will come to you and answer your question individually. It is very important that you obey these rules, since we would otherwise be forced to exclude you from the experiment and all related payments.

In the experiment you will earn money according to your own decisions, those of other participants, and random events. The show up fee of €2.50 will be taken into account in your payment. In the experiment, we shall speak of ECU (Experimental Currency Units) rather than Euro. The total amount of ECU you earn will be converted into Euro at the end of the experiment. The conversion rate is 10 ECU = 1 Euro.

Please note that it is possible to make a loss in this experiment. If this happens, you would have to come to the Max Planck Institute and do some office work. By this, you will be paid at €7 per hour. However, this can only be used to repay your losses (not to increase your earnings).

The experiment will consist of 2 phases. The following instructions only refer to the first phase. Instructions for the second phase will be given to you after the first phase is finished. Both phases of the experiment will be paid, and your performance in the first phase does not influence your payment in second phase.

DETAILED INFORMATION FOR THE FIRST PHASE

For ten different situations, you have to choose one of two options X or Y. These 10 different situations will be presented on screen. Option Y pays out 50 ECU with certainty. Option X yields 2 possible monetary outcomes, 70 ECU and 30 ECU that are paid out according to the probabilities noted. While the two possible outcomes remain constant in all 10 situations, their probabilities vary. Options X and Y will be presented as shown in Table 1.

For instance, in situation 1 of the table, option X yields 70 ECU with probability $1/10$ and 30 ECU with probability $9/10$. Option Y yields 50 ECU with certainty.

On the right hand side, you have to click the option you choose. For option X click the left circle, and for option Y the right circle. Please note that at the end of the experiment (after phase 2), only one of these 10 situations will be randomly selected to be paid out. All situations are equally likely, i.e., the computer picks a random number from 1 to 10

Please, choose one of the two options in each of the 10 cases.

	Option X	Option Y	
1	with $1/10$ a gain of 70 ECU, with $9/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
2	with $2/10$ a gain of 70 ECU, with $8/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
3	with $3/10$ a gain of 70 ECU, with $7/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
4	with $4/10$ a gain of 70 ECU, with $6/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
5	with $5/10$ a gain of 70 ECU, with $5/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
6	with $6/10$ a gain of 70 ECU, with $4/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
7	with $7/10$ a gain of 70 ECU, with $3/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
8	with $8/10$ a gain of 70 ECU, with $2/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
9	with $9/10$ a gain of 70 ECU, with $1/10$ a gain of 30 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$
10	a sure gain of 70 ECU	a sure gain of 50 ECU	$X \bigcirc \bigcirc Y$

Table 1: Presentation of the options

and thereby determines the situation that will be paid out. If in the randomly selected situation you pick Y, then you get 50 ECU for sure. Otherwise, to determine your payment, a second random number Z in the range of 0 to 10 (with 2 decimals) is generated. For the case described above, where probabilities for option X are $1/10$ and $9/10$, the outcome is determined as follows. If the random number Z falls between 0 and 1 ($0 \leq Z \leq 1$), i.e., with probability $1/10$, option X yields 70 ECU. If the random number Z falls between 1 and 10 ($1 < Z \leq 10$), i.e., with probability $9/10$, the option yields 30 ECU.

DETAILED INFORMATION FOR THE SECOND PHASE

In this phase there are 32 participants, divided into 4 groups with 8 participants each. You belong to one of these 4 groups, and you will play with the same 7 other participants repeatedly in this phase. The identities of the 7 participants you play with will not be revealed to you at any time.

This phase consists of 6 rounds. At the beginning of each round, we will grant you a interest free credit bundle, which is composed of M_{ini} amount of ECU and N_{ini} units of risky alternative R. The M_{ini} ECU will be automatically deposited into a bank which pays you 1.5 times the deposited amount for sure. Each unit of risky alternative R allows you to gain:

- ▷ a high amount H of ECU with 50% probability;
- ▷ a low amount L of ECU with 50% probability.

The amounts H and L will vary from round to round and will be revealed to you at the beginning of each round.

You can trade risky alternatives with the 7 other participants in your group. The ECU needed for buying risky alternative R will be deducted from the ECU you have in the bank. The ECU you get from selling risky alternative R will be automatically deposited into the bank.

The trading in each round lasts 3 minutes. It operates as follows.

1. You must state a) whether you want to buy or sell units of risky alternative R, b) how many units you want to buy or sell, and c) the price per unit. The request takes the following form:

   I want to buy (or sell) _ units of risky alternative R at price _ per unit.

   You will not see the requests made by the other 7 group members.
2. After one minute, all requests of your group will be aggregated, and a **suggestive price** P will be published to each member of your group. This price is chosen to maximize the exchanged units of risky alternative R. The suggestive price P is not the actual trading price; it only indicates that if the current requests are not changed until the end of the 3 minutes, then the requests satisfying the following three conditions will be executed at the suggestive price P

   Trading Condition 1: all **buy** requests with price higher than P;

   Trading Condition 2: all **sell** requests with price lower than P;

   Trading Condition 3: for **sell** or **buy** requests at the suggestive price, only the minimum of the two will be traded. That is, if demands are larger than supplies, these sell requests will be randomly allocated to buy requests; if supplies are larger than demands, these buy requests will be randomly allocated to sell requests.
   Suppose, for example, that the suggestive price is $P = 9$, and you requested to buy 5 units of risky alternative R at the price of 17 ECU per unit. Since $17 \geq 9$ (Trading Condition 1), these requests will be executed at $P = 9$ (not at 17). If, instead, you requested to buy 5 units of R at the price of 8 ECU per unit, this request will not be executed because $8 < 9$. If you requested to buy 10 units of R at $P = 9$, but there are only 5 sell units at 9, then you will only get 5 units.
3. After knowing the suggestive price, you can change your requests within the next one minute.
4. At the end of the second minute, all requests will be once again aggregated to give a new suggestive price, and you can adjust your requests in the next 1 minute.
5. At the end of 3 minutes, the trading ceases and a unique actual trading price P^* is published, which is the same for all the 8 participants in the your group. All requests

satisfying the three trading conditions (**Trading Condition 1,2,3**) described in step 2 above are executed.

The ECU you have in the bank after the trading (M_{end}) will be multiplied by 1.5. Depending on your trading activities, this amount can also be negative. The units of risky alternative R you have after the trading N_{end} allows you to obtain:

- $N_{end} \times H$ ECU with 50% probability;
- $N_{end} \times L$ ECU with 50% probability.

However, the credit you have taken has to be paid back fully, i.e., you will have to pay back M_{ini} and N_{ini} units of risky alternative R. The remaining ECU will be your round net profit (which can also be negative).

Suppose that we grant you M_{ini} ECU and N_{ini} units of risky alternative R, and after the trading you have M_{end} ECU in the bank and N_{end} units of the risky alternative. If the price of a unit of risky alternative R at the end of the trading is P^*, and the risky alternative R obtains H, then:

- the value of your initial bundle (M_{ini} ECU and N_{ini} units of risky alternative R) is $M_{ini} + N_{ini} \times P^*$;
- the value of your final bundle (M_{end} ECU and N_{end} units of risky alternative R) is $1.5\, M_{end} + N_{end} \times P^* + N_{end} \times H$.

Your round earnings is calculated as follows:

$$\begin{aligned} \textit{Round earnings} &= \textit{the value of your final bundle} - \textit{the value of your initial bundle} \\ &= 1.5\, M_{end} + N_{end} \times P^* + N_{end} \times H - M_{ini} - N_{ini} \times P^* \end{aligned}$$

The information you receive

At the end of each round, you will receive information about 1) the actual trading price P^*, and 2) your final holdings of ECU (M_{end}) and units of risky alternative R (N_{end}).

At the end of this phase, you will receive information about 1) the outcome that risky alternative R obtains in each round, 2) your net profit in each round, 3) the round chosen for payment, and 4) your final experimental earnings.

Your experimental earnings in this phase

At the end of this phase, only *one* round will be randomly chosen for payment. The resulting amount will be converted to euros and paid out in cash.

Two training rounds

In order to get acquainted with the structure of the experiment, you will have two training rounds before the real experiment starts. These two rounds will not be chosen for payment.

Before the experiment starts, you will have to answer some control questions to ensure your understanding of the experiment.

S2 Instructions for the control experiment

Welcome! You are about to participate in an experiment funded by the Max Planck Institute of Economics. Please switch off your mobiles and remain silent. It is strictly forbidden to talk to other participants. Please raise your hand whenever you have a question; one of the experimenters will come to your aid.

You will receive €2.50 for showing up on time. Besides this, you can earn more. But there is also a small possibility of ending up with a loss. The show-up fee and any additional amounts of money you may earn will be paid to you in cash at the end of the experiment. Payments are carried out privately, i.e., the others will not see your earnings.

Throughout the experiment, we shall speak of ECU (Experimental Currency Units) rather than Euro. The conversion rate is 10 ECU = 1 Euro.

You will not interact with any other participant. Your earnings during the experiment will depend on your own decisions and on chance. Think carefully and make your decisions at the pace you feel comfortable with. There are no right or wrong decisions.

The experiment consists of 8 rounds. You will be facing the same decision situation in each round.

The situation you will face in each round

At the beginning of each round you will be endowed with M_{ini} ECU and N_{ini} units of a risky alternative. The value of M_{ini} will vary from round to round. The value of N_{ini} can be either 12 or 13. You will be told your initial endowment M_{ini} of ECU and whether you own 12 or 13 units of the risky alternative at the beginning of each round.

The $\boldsymbol{M_{ini}}$ **ECU in your possession** will be automatically deposited in a bank which pays you 1.5 times the deposited amount *for sure* at the end of the round. Thus, if you have 100 ECU in the bank, you get $100 \times 1.5 = 150$ ECU at the end of the round. Similarly, if you have 50 ECU in the bank, you get $50 \times 1.5 = 75$ ECU.

***Each unit* of the risky alternative** allows you to gain

- ▷ a high amount H of ECU with 50% probability;
- ▷ a low amount L of ECU with 50% probability.

Suppose that $H = 10$ and $L = 5$. Then each unit of the risky alternative allows you to gain 10 ECU with 50% probability and 5 ECU with 50% probability. If you own 12 units of this risky alternative, you have either 120 ECU with 50% probability or 60 ECU with 50% probability. The amounts H and L will vary from round to round and will be revealed to you at the beginning of each round. The risky alternative will be always presented in

the following form:

Gain	*Probability*
H ECU	50%
L ECU	50%

What you have to do

In each round you will be asked to buy further B units of the risky alternative you confront in that round, and to sell S units of it. There will be four buy decisions and four sell decisions. These eight decisions will differ in the units of the risky alternative you must buy (B) and the units of the risky alternative you must sell (S). The values of B and S will be displayed on your computer screen at the time of your decisions.

• *Buy decisions*

For the buy decisions, you must report the highest amount of ECU for which you would be willing to buy <u>*each*</u> of the B units of the round's risky alternative. In other words, you have to state your maximum buying price of each of the B units. Such decisions take the following form:

Gain	*Probability*
H ECU	50%
L ECU	50%

You must buy B units of the above risky alternative.
What is the maximum price are you willing to pay for *each unit*?

The ECU needed for buying the predetermined B units of the risky alternative will be deducted from the M_{ini} ECU you have in the bank.

If you need more than M_{ini} ECU for carrying out a buy decision, you can borrow these extra ECU from the bank at a gross interest rate of 1.5. Suppose, for instance, that $M_{ini} = 50$ ECU, but you need 120 ECU for buying the B units specified by the buy decision. You can borrow 70 ($= 120-50$) ECU from the bank and then pay 105 ($= 70\times 1.5$) ECU back at the end of the round.

• *Sell decisions*

For the sell decisions, you must report the lowest amount of ECU for which you would be willing to sell <u>*each*</u> of the S units of the round's risky alternative. In other words, you

have to state your minimum selling price of each of the S units. Such decisions take the following form:

Gain	*Probability*
H ECU	50%
L ECU	50%

You must sell S units of the above risky alternative.
What is your minimum selling price for *each unit*?

The ECU you get from selling the predetermined S units of the risky alternative will be automatically deposited in the bank and earn an gross interest rate of 1.5.

For each of your eight decisions, irrespective of whether they are buy or sell decisions, you must state an amount between **0.50** and **12.00** ECU (up to two digits after the decimal).

Your round payoff

Your payoff in each round will depend on your decisions and on two random choices made by the computer. More specifically, your round payoff is determined as follows.

After you have made all your eight decisions, the computer will randomly select one of your decisions as the "relevant decision".

If the relevant decision is a buy decision, the computer will randomly choose a number between 0.50 and 12.00 (with two digits after the decimal). You can think of this number as the price at which the experimenters would sell each unit of the risky alternative.

- If this random number (i.e., the price at which the experimenters would sell each unit of the risky alternative) is greater than the maximum amount of ECU you were willing to pay for each unit, you do not buy any units of the risky alternative.
- If this random number is smaller than or equal to the maximum amount of ECU you were willing to pay for each unit, you buy the B units specified in the relevant decision, and pay *for each unit* an amount of ECU equal to the random number (i.e., equal to the price at which the experimenters would sell each unit; not to the amount you stated!). So, if we refer to this random number as p_B, you pay $p_B \times B$.

If the relevant decision is a sell decision, the computer will again randomly choose a number between 0.50 and 12.00 (with two digits after the decimal). Now you can think of this number as the price at which the experimenters would buy each unit of the risky alternative.

– If this random number (i.e., the price at which the experimenters would buy each unit of the risky alternative) is smaller than the minimum amount of ECU you asked for each unit, you do not sell any units of the risky alternative.
– If this random number is greater than or equal to the minimum amount of ECU you asked for each unit, you sell the S units specified in the relevant decision, and collect *for each unit* an amount of ECU equal to the random number (i.e., equal to the price at which the experimenters would buy each unit; not to the amount you stated!). So, if we refer to this random number as p_S, you collect $p_S \times S$.

With this mechanism it is in your best interest to state the "true" amount of ECU for which you would be willing to buy or to sell each unit of the risky alternative under consideration. Not reporting your true willingness to pay (in the buy decisions) and your true willingness to ask (in the sell decisions) will not help you.

The ECU you have in the bank at the end of the round (M_{end}) will be multiplied by 1.5. The resulting amount will be paid to you if it is positive, and will be paid by you if it is negative. M_{end} differs from M_{ini} (your initial endowment of ECU) only if you carry out a transaction, i.e., if you buy the B units specified by a relevant "buy" decision or you sell the S units specified by a relevant "sell" decision.

The units of the risky alternative you have at the end (N_{end}) allow you to gain

- $N_{end} \times H$ ECU with 50% probability;
- $N_{end} \times L$ ECU with 50% probability.

N_{end} differs from N_{ini} (your initial units of the risky alternative) only if you carry out a transaction.

To sum up, the following outcomes are possible.

– The relevant buy or sell decision does not result in any transaction. In this case, $M_{end} = M_{ini}$ and $N_{end} = N_{ini}$. Therefore

$$\text{your round payoff} = \begin{cases} M_{ini} \times 1.5 \quad + \quad N_{ini} \times H \quad \text{with 50\% probability,} \\ M_{ini} \times 1.5 \quad + \quad N_{ini} \times L \quad \text{with 50\% probability.} \end{cases}$$

– The relevant decision is a buy decision and you buy the B units of the risky alternative at a price equal to the random number p_B. In this case, $M_{end} = M_{ini} - p_B B$ and $N_{end} = N_{ini} + B$. Therefore

$$\text{your round payoff} = \begin{cases} (M_{ini} - p_B B) \times 1.5 \quad + \quad (N_{ini} + B) \times H \quad \text{with 50\% probability,} \\ (M_{ini} - p_B B) \times 1.5 \quad + \quad (N_{ini} + B) \times L \quad \text{with 50\% probability.} \end{cases}$$

– The relevant decision is a sell decision and you sell the S units of the risky alternative

at a price equal to the random number p_S. In this case, $M_{end} = M_{ini} + p_S S$ and $N_{end} = N_{ini} - S$. Therefore

$$\text{your round payoff} = \begin{cases} (M_{ini} + p_s S) \times 1.5 \quad + \quad (N_{ini} - S) \times H \quad \text{with 50\% probability,} \\ (M_{ini} + p_s S) \times 1.5 \quad + \quad (N_{ini} - S) \times L \quad \text{with 50\% probability.} \end{cases}$$

At the end of each round, the computer will determine whether each unit of the risky alternative pays H or L ECU out.

The following examples should help you better understand the calculation of your round payoff.

Example 1
Suppose that you are endowed with $M_{ini} = 10$ ECU and $N_{ini} = 12$ units of a risky alternative, each unit of which allows you to gain either 8 or 4 ECU with 50% probability each. Suppose also that the randomly selected relevant decision is a buy decision in which you are asked to buy $B = 4$ units of the above risky alternative. Suppose finally that you report a maximum buying price of 6.45 ECU, and that the outcome of the risky alternative is 8 ECU.

- If the random number chosen by the computer is $p_B = 7$, you do not buy any units of the risky alternative (because $7 > 6.45$). This implies that you have (i) 10 ECU in the bank, from which you obtain $(10 \times 1.5) = 15$ ECU; (ii) 12 units of the risky alternative, from which you gain $(12 \times 8) = 96$ ECU. Your round payoff is therefore $15 + 96 = 111$ ECU.
- If the random number chosen by the computer is $p_B = 5.75$, you buy the 4 units of the risky alternative (because $5.75 < 6.45$) at the price of 5.75. This implies that you now have: (i) $10 - (5.75 \times 4) = -13$ ECU in the bank, i.e. you must pay $-13 \times 1.5 = -19.5$ ECU; (ii) $12 + 4 = 16$ units of the risky alternative, from which you gain $(16 \times 8) = 128$ ECU. Your round payoff is therefore $-19.5 + 128 = 108.5$ ECU.

Example 2
Suppose that you are endowed with $M_{ini} = 20$ ECU and $N_{ini} = 12$ units of a risky alternative, each unit of which allows you to gain either 10 or 5 ECU with 50% probability each. Suppose now that the randomly selected relevant decision is a sell decision in which you are asked to sell $S = 2$ units of the above risky alternative. Suppose finally that you report a minimum selling price of 5.25 ECU, and that the outcome of the risky alternative is 5 ECU.

- If the random number chosen by the computer is $p_S = 8.50$, you sell the 2 units

of the risky alternative (because $8.50 > 5.25$). This implies that you have: (i) $20 + (8.50 \times 2) = 37$ ECU in the bank, from which you obtain $37 \times 1.5 = 55.5$ ECU; (ii) $12 - 2 = 10$ units of the risky alternative, from which you gain $(10 \times 5) = 50$ ECU. Your round payoff is therefore $55.5 + 50 = 105.5$ ECU.

The information you receive at the end of each round

At the end of each period, you will receive information about 1) the decision chosen by the computer as the relevant decision, 2) the random number selected by the computer, 3) whether or not you carry out the transaction corresponding to the relevant decision, 4) the outcome of the risky alternative, and 5) your corresponding round payoff.

Your final payoff

At the end of the experiment, one experimenter will randomly select one participant by drawing a ball from an urn that contains as many balls as the number of participants. This participant will in his turn randomly select one of the eight rounds of the experiment by drawing a ball from an urn containing eight balls numbered 1 to 8. This round payoff will be converted to euros (at the exchange rate of 10 ECU = 1 Euro) and paid out in cash.

In case of a negative payoff, losses up to €2.50 (= 25 ECUs) will be covered by your show-up fee. There are two alternatives concerning losses in excess of €2.50. The first is to pay the difference from your own money. The second is to pay the difference by performing (before leaving the lab) a task which consists of counting the occurrences of a specific letter in a lengthy text. You will be compensated with €1.00 for each correctly counted sentence. The drill is introduced to allow you to repay your losses; there is no way of earning extra money from it.

Before starting you will have to answer some control questions which will ensure your understanding of the rules of the experiment. Once everybody has answered all questions correctly, two practice rounds will help you familiarize yourself with the dynamics of the experiment. The result of these rounds will <u>not</u> be relevant to your final payoff.

Please remain quietly seated during the whole experiment. If you have any questions, please raise your hand now. Please click "ok" on your computer screen when you have finished reading the instructions of this part of the experiment.