

Supplement to
“Measuring Ambiguity Attitudes for All (Natural)
Events”

Aurélien Baillon, Zhenxing Huang, Asli Selim, & Peter P. Wakker

March, 2018

Appendix OA Results excluding violations of weak
monotonicity

Weak monotonicity was violated was violated by 2 subjects in part 1 of the control treatment, 3 subjects in part 1 of the TP treatment, and 2 subjects in part 2 of the TP treatment. Hence, excluding the indexes when weak monotonicity is violated results in dropping 7 observations. Tables OA.1 and OA.2 below are equivalent to Tables III and IV of the paper when these 7 observations are dropped. Unlike in Table III, part 2 * control treatment (capturing learning effects in the control treatment) is not significant anymore in Model 1 but it is still marginally significant in Model 2.

TABLE OA.1: Ambiguity aversion indexes b

	Model 1	Model 2
Intercept	-0.08* (0.03)	0.03 (0.06)
Part 1 * TP treatment	-0.03 (0.05)	-0.04 (0.05)
Part 2 * control treatment	-0.04 (0.03)	-0.04 [†] (0.03)
Part 2 * TP treatment	0.00 (0.05)	-0.02 (0.05)
Male		-0.08 [†] (0.04)
Dutch		-0.08 (0.05)
Age – 20		0.02 (0.01)
Chi2	4.08	14.68*
N	191	191

[†] $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Point estimates are followed by standard errors between brackets. The impact of TP is in bold. The variable age has been recoded as age – 20 so that the intercept corresponds to the b index of a 20-year-old subject (median age).

TABLE OA.2: A-insensitivity indexes a

	Model 1	Model 2
Intercept	0.10 [†] (0.06)	0.17 (0.11)
Part 1 * TP treatment	0.19* (0.08)	0.18* (0.08)
Part 2 * control treatment	0.07 (0.05)	0.06 (0.05)
Part 2 * TP treatment	0.03 (0.08)	0.02 (0.09)
Male		-0.04 (0.08)
Dutch		-0.07 (0.09)
Age – 20		0.01 (0.02)
Chi2	14.56**	16.82*
N	191	191

[†] $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Point estimates are followed by standard errors between brackets. The impact of TP is in bold. The variable age has been recoded as age – 20 so that the intercept corresponds to the a index of a 20-year-old subject (median age).

Appendix OB Impact of TP on index b

We tested whether TP would make index b more or less extreme by running the same regressions as described in the main text on the absolute value of b . TP did not have any impact on the magnitude of b .

TABLE OB.1: Absolute value of the ambiguity aversion indexes b

	Model 1	Model 2
Intercept	0.18*** (0.02)	0.15*** (0.04)
Part 1 * TP treatment	0.01 (0.03)	0.01 (0.03)
Part 2 * control treatment	0.02 (0.02)	0.02 (0.02)
Part 2 * TP treatment	0.02 (0.03)	0.02 (0.03)
Male		0.02 (0.03)
Dutch		0.02 (0.03)
Age – 20		0.00 (0.01)
Chi2	0.94	1.55
N	198	198

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Point estimates are followed by standard errors between brackets. The impact of TP is in bold. The variable age has been recoded as age – 20 so that the intercept corresponds to the b index of a 20-year-old subject (median age).

Appendix OC Descriptive statistics of the matching probabilities

TABLE OC.1: Statistics of the matching probabilities (mean, standard deviation, standard error of the mean, median, interquartile range and number of observations)

Part 1		m_1	m_2	m_3	m_{23}	m_{13}	m_{12}	\overline{m}_s	\overline{m}_c
Control	<i>mean</i>	.39	.38	.41	.69	.69	.65	.39	.67
	<i>std</i>	.16	.17	.17	.15	.19	.19	.13	.13
	<i>ste</i>	.03	.03	.03	.02	.03	.03	.02	.02
	<i>median</i>	.38	.38	.38	.70	.73	.63	.39	.71
	<i>iqr</i>	.20	.15	.15	.20	.30	.25	.10	.21
	<i>N</i>	42	42	42	42	42	42	42	42
TP	<i>mean</i>	.42	.46	.42	.67	.66	.64	.43	.65
	<i>std</i>	.16	.16	.17	.18	.22	.18	.13	.15
	<i>ste</i>	.02	.02	.02	.02	.03	.02	.02	.02
	<i>median</i>	.43	.43	.43	.68	.73	.68	.43	.68
	<i>iqr</i>	.20	.15	.20	.15	.25	.25	.15	.21
	<i>N</i>	57	57	57	57	57	57	57	57
Part 2		m_1	m_2	m_3	m_{23}	m_{13}	m_{12}	\overline{m}_s	\overline{m}_c
Control	<i>mean</i>	.47	.38	.40	.68	.68	.72	.42	.69
	<i>std</i>	.16	.15	.20	.16	.18	.18	.14	.14
	<i>ste</i>	.02	.02	.03	.02	.03	.03	.02	.02
	<i>median</i>	.43	.38	.40	.73	.70	.73	.40	.72
	<i>iqr</i>	.15	.20	.20	.30	.30	.30	.15	.19
	<i>N</i>	42	42	42	42	42	42	42	42
TP	<i>mean</i>	.43	.40	.35	.63	.65	.73	.39	.67
	<i>std</i>	.18	.18	.16	.19	.23	.18	.12	.16
	<i>ste</i>	.02	.02	.02	.02	.03	.02	.02	.02
	<i>median</i>	.43	.43	.38	.68	.63	.78	.39	.69
	<i>iqr</i>	.20	.20	.15	.20	.35	.25	.13	.20
	<i>N</i>	57	57	57	57	57	57	.42	.69

FIGURE OC.1: Comparing matching probabilities between parts

Note: the events differ between parts but largely overlaps. The matching probabilities are likely to be correlated but may differ.

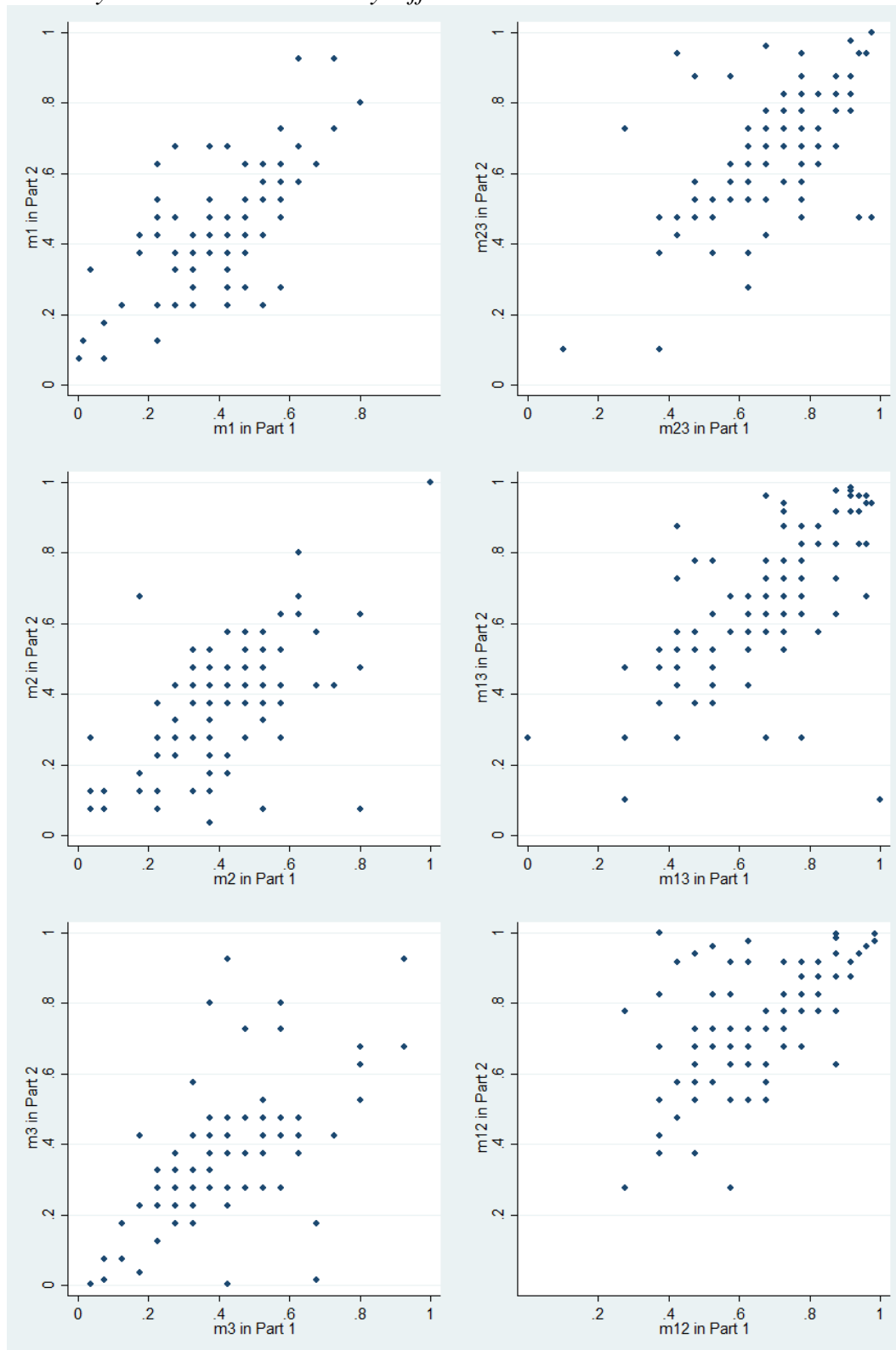


FIGURE OC.2: \overline{m}_s and \overline{m}_c compared between part 1 and part 2

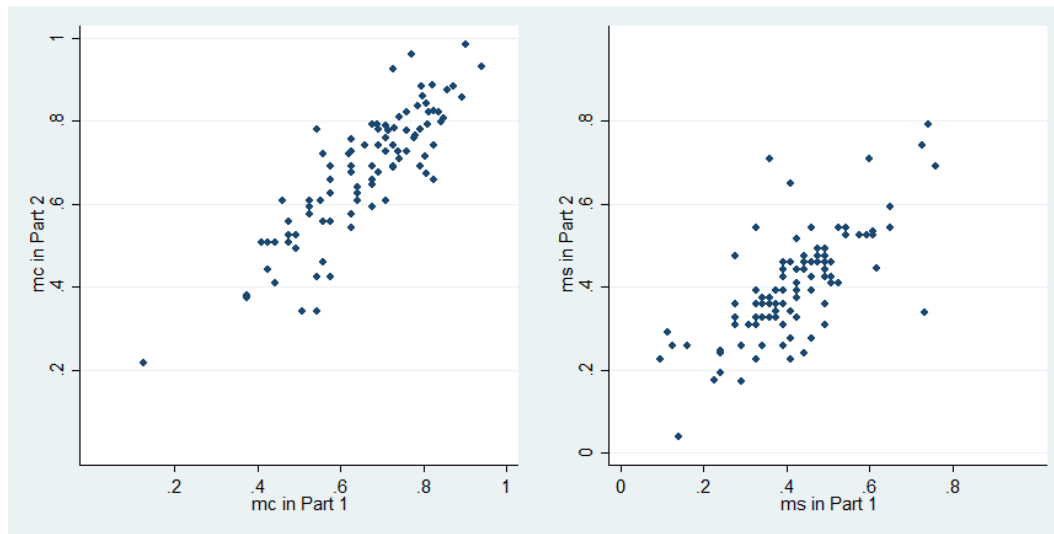
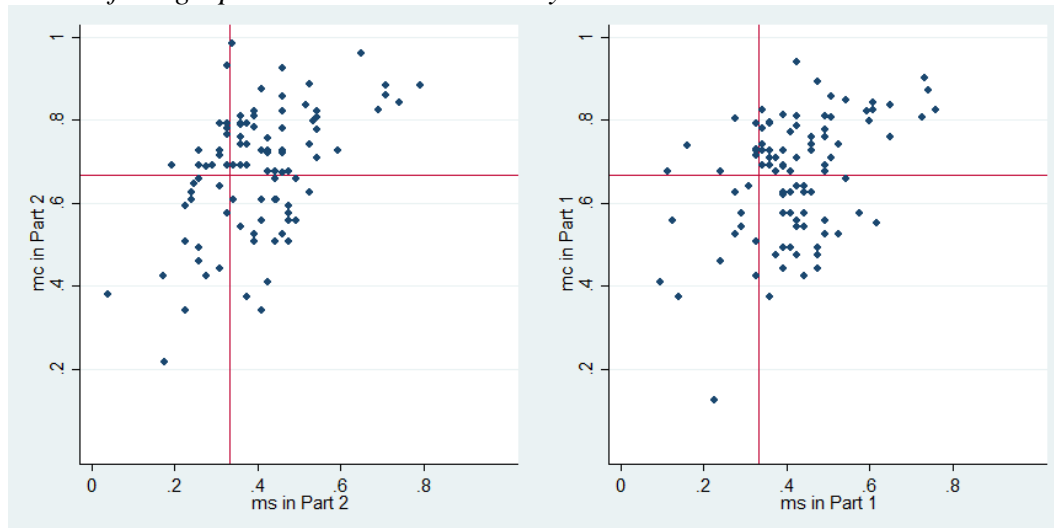


FIGURE OC.3: \overline{m}_s compared to \overline{m}_c

Note: The intersection of the red lines indicates expected utility. The lower left quadrant signals ambiguity aversion and the upper right ambiguity seeking. The center of the graph indicates a-insensitivity.



Appendix OD Time pressure and consistency in Part 1

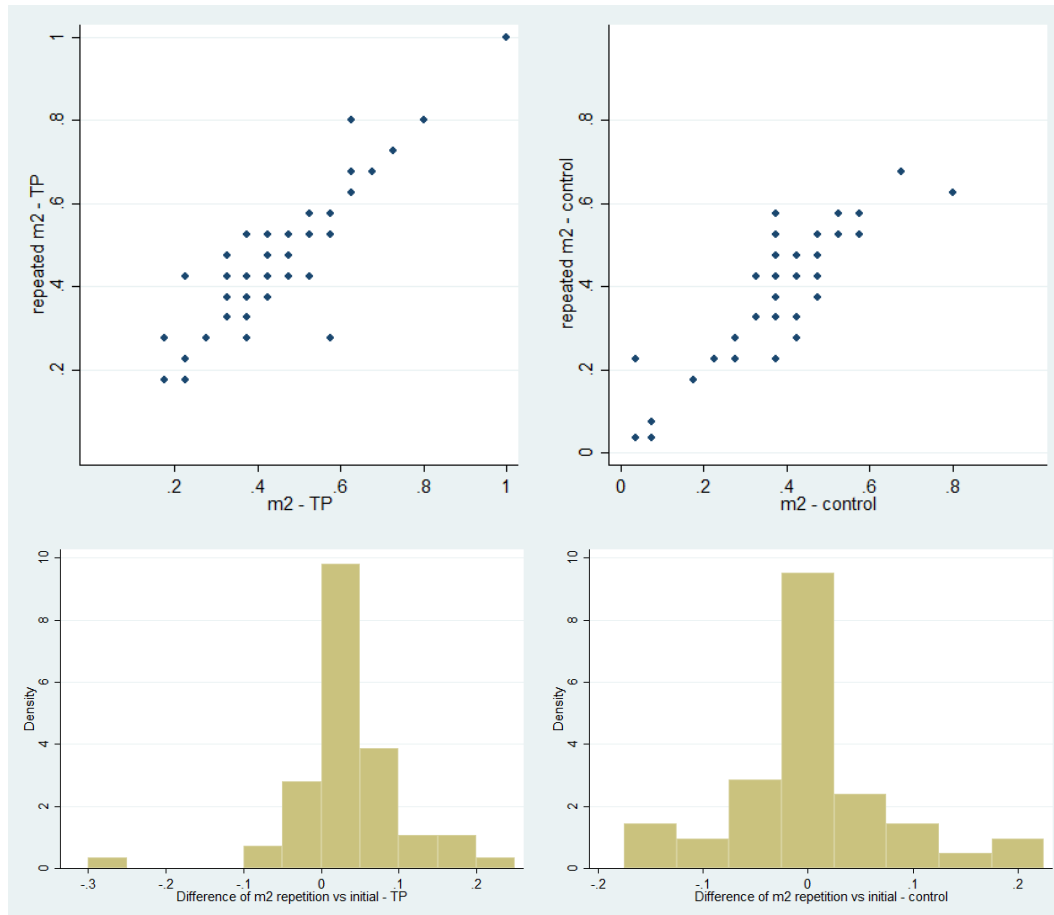
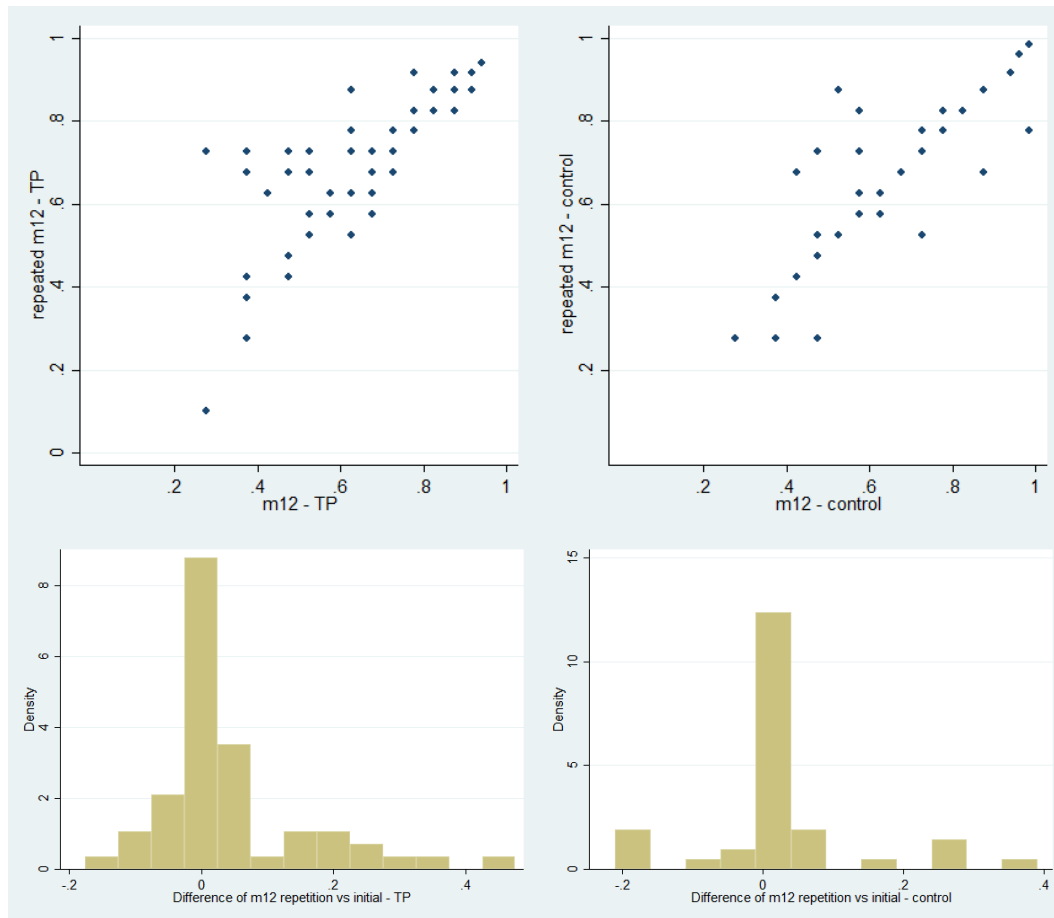
FIGURE OD.1: Consistency of m_2 for the TP treatment (left) and control (right)

FIGURE OD.2: Consistency of m_{12} for the TP treatment (left) and control (right)

Comparing the distribution of response errors (difference between the initial and repeated elicitations) between the TP treatment and the control group, we found differences neither for m_2 nor for m_{12} (according to Kolmogorov-Smirnov tests of equal distributions, tests of standard deviations, and t-tests of means).

Appendix OE Instructions of the experiment

The instructions of the experiment consisted of three parts: (1) (practical) instructions read aloud after the subjects had entered the room; (2) instructions about the choices in the experiment displayed on the screen, followed by sample questions; (3) payment instructions after the sample questions. Details follow.

OE1. Instructions read aloud after the subjects had entered

Welcome and thank you for participating in this experiment.

It is forbidden to use cell phones. Turn them off and put them in your bags.

Do not talk before the payment procedure at the end of the experiment.

Stay on the experimental page and don't do anything else on the computer.

We'll give you €5 show up money, but you may win €20 more according to the choices that you make during the experiment.

We'll give you tickets with ID's. Type them in to start. Keep your tickets so as to be paid later on.

Do not start until you're told to do so.

OE2. Instructions about the choices displayed on the screen

Welcome!

Thank you for taking part in our experiment.

This experiment comprises three sections. At the end of the first section you will be notified that you have completed the first section and the program will automatically proceed to the second section. There will be a two-minute break before the start of the second section, but you are requested to remain seated during the break. There will be a similar break between the second and the third section. Each section will consist of 8 questions which will require you to state your preference between bets on given probabilities and bets on the stock index.

In each question you will be presented with two options of the following type:

Option 1 (AEX option): You win €20 if the AEX (Amsterdam stock exchange index) either decreases by less than 0.3% or increases by less than 0.2% today between the beginning and the end of the experiment, and you win nothing otherwise.

Option 2 (given probability option): You win €20 with $p\%$ probability and nothing otherwise.

In all questions, as in the above example, you will be offered the chance to win €20 . You will be asked to state which one of these two options you prefer for various values p , from 0 to 100.

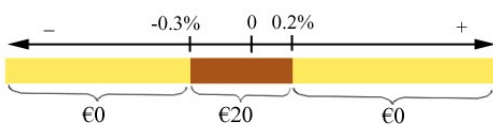
Let us illustrate it with the example given above for some values of p :

If $p = 100$, you will most likely prefer Option 2 because you are then guaranteed to win €20.

If $p = 0$, then you will most likely prefer Option 1, as you might win something, as opposed to Option 2, where there is no chance of you to win at all.

The experiment page will look similar to the figure below.

Which option do you prefer?

Option 1	1	2	Option 2
<p><i>You win €20 if the AEX either decreases by less than 0.3% or increases by less than 0.2% (and nothing otherwise)</i></p> 			<p><i>You win €20 with the following probability (and nothing otherwise)</i></p>
	<input checked="" type="radio"/>	<input type="radio"/>	0%
	<input checked="" type="radio"/>	<input type="radio"/>	1%
	<input checked="" type="radio"/>	<input type="radio"/>	2%
	<input checked="" type="radio"/>	<input type="radio"/>	5%
	<input checked="" type="radio"/>	<input type="radio"/>	10%
	<input checked="" type="radio"/>	<input type="radio"/>	15%
	<input checked="" type="radio"/>	<input type="radio"/>	20%
	<input checked="" type="radio"/>	<input type="radio"/>	25%
	<input checked="" type="radio"/>	<input type="radio"/>	30%
	<input checked="" type="radio"/>	<input type="radio"/>	35%
	<input checked="" type="radio"/>	<input type="radio"/>	40%
	<input checked="" type="radio"/>	<input type="radio"/>	45%
	<input type="radio"/>	<input checked="" type="radio"/>	50%
	<input type="radio"/>	<input checked="" type="radio"/>	55%
	<input type="radio"/>	<input checked="" type="radio"/>	60%
	<input type="radio"/>	<input checked="" type="radio"/>	65%
	<input type="radio"/>	<input checked="" type="radio"/>	70%
	<input type="radio"/>	<input checked="" type="radio"/>	75%
	<input type="radio"/>	<input checked="" type="radio"/>	85%
	<input type="radio"/>	<input checked="" type="radio"/>	100%

Submit

As you can see in the figure, on the left you will have a description of Option 1, along with a simple graph to help you understand the bet better.

On the right hand side Option 2 will be presented with ascending p values. For each value of p you are asked to state your preference between the AEX option and the given probability option by clicking on the respective option button.

Note that if you prefer the AEX option when, for instance, the given probability option offers you 40% chance of winning (that is $p = 40$), then when the given probability option offers an even lower chance of winning, say 25% ($p = 25$), then you should again choose the AEX option over the given probability option. Similarly, imagine that you like the given probability option better than the AEX option when $p = 60$. Then, when the given probability option offers an even better chance of winning, say $p = 70$, then it is expected that you still prefer the given probability option to the AEX option.

If you do not agree with or understand this principle please call one of the experimenters now.

Accordingly, you will notice that in the figure above there is only a single switch from 45% to 50%. For every value of p from 0 until 45% Option 1 is chosen, and for all values of p from 50% up, Option 2 has been selected. To save you the trouble of clicking on the option button for each value of p , the program has been designed to work with a single click.

You can click on Option 2 for the probability such that, for that probability and all better (higher) probabilities, you prefer Option 2, and for all worse (lower) probabilities you prefer Option 1. Similarly, you can also click on Option 1 for the probability such that, for that probability and all worse (lower) probabilities, you prefer Option 1, and for all better (higher) probabilities you prefer Option 2. The computer will then automatically indicate all of your choices.

For example, in the figure above, the subject has only clicked on the option button for the p value 50%, and then all the option boxes for the other values of p have been automatically filled by out the program itself.

You can change your choices as many times as you want. However, once you have made your final decision and clicked on the appropriate option box, you will need to click the “Submit” button to register your choices and move on to the next question.

You will not be allowed to go back to a question once you have clicked on the “Submit” button.

When you click “Next”, you will be presented with two sample questions. As you will notice, the list of values for p (in Option 2) will not be the same for the two questions. The sample questions allow you to familiarize yourself with the interface of the experiment.

*OE3. Payment instructions (after sample questions)***Payment**

Once you complete the experiment, one of your choices will be played out for real by the experimenters.

We will randomly pick one question out of the two sections and one value of p and check which option you chose in the experiment.

If you preferred the bet on the stock index, then we will check how much the AEX has changed between the beginning and the end of the experiment, show it to you, and pay you accordingly. If, on the other hand, you preferred Option 2, then we will play out your choice with the help of two 10-sided dice. (see picture below).



One of these dice has the numbers 0, 10, 20, 30, ..., 90 on its faces, and the other one 0, 1, 2, 3, ..., 9. Therefore, by tossing these two dice and adding their results, we can get any number from 0 to 99. Probability $p\%$ is equivalent to the probability of drawing a number less than p out of 0,1,2...99. Thus, if the bet is "You win €20 with 74% probability and nothing otherwise," then if the sum of the two dice is strictly less than the value of 74 you will win the bet.

We will present two examples, based on the following figure, to help you understand the payment scheme better.

Which option do you prefer?

Option 1		Option 2	
You win €20 if the AEX either decreases by less than 0.3% or increases by less than 0.2% (and nothing otherwise)		1	2
		<input type="radio"/>	0%
		<input type="radio"/>	1%
		<input type="radio"/>	2%
		<input type="radio"/>	5%
		<input type="radio"/>	10%
		<input type="radio"/>	15%
		<input type="radio"/>	20%
		<input type="radio"/>	25%
		<input type="radio"/>	30%
		<input type="radio"/>	35%
		<input type="radio"/>	40%
		<input type="radio"/>	45%
		<input checked="" type="radio"/>	50%
		<input type="radio"/>	55%
<input type="radio"/>	60%		
<input type="radio"/>	65%		
<input type="radio"/>	70%		
<input type="radio"/>	75%		
<input type="radio"/>	85%		
<input type="radio"/>	100%		

Submit

Example 1

Imagine that, at the end of the experiment, the question above is played for real money for $p=10\%$. The figure indicates that, for $p=10\%$, Option 1 is preferred. You would therefore win €20 if the AEX either decreases by less than 0.3% or increases by less than 0.2% between the beginning and the end of the experiment and nothing otherwise.

Let us assume that at the end of the experiment we found out that between the beginning and the end of the experiment the AEX has decreased by 0.1%.

What would be the payment? Please select an answer.

- I don't win anything.
- I win 20 euros.
- I don't know.

Example 2

Imagine that, at the end of the experiment, the question above is played for real money for $p=60\%$. The figure indicates that, for $p=60\%$, Option 2 is preferred.

We toss our 10-sided dice, and the outcome is as follows: 20 and 2.

What would be the payment? Please select an answer.

- I don't win anything.
- I win 20 euros.
- I don't know.

At any time, feel free to call an experimenter if you have any questions.

Click on the button to start the experiment