

## Experiment Overview

You are about to participate in an experiment in the economics of decision-making. If you listen carefully, you could earn a large amount of money, that will be paid to you in cash, in private, at the end of the experiment.

It is important that you remain silent and do not look at other people's work. If you have any questions, or need any assistance of any kind, please raise your hand and an experimenter will help you out. During the experiment, **do not talk, laugh or exclaim out loud** and be sure to keep your **eyes on your screen only**. In addition, please **turn off your cell phones, etc.** and put them away during the experiment. Anybody that violates these rules will be asked to leave and will **not** be paid. We expect, and appreciate your cooperation.

## Agenda

1. We will first go over the instructions.
2. Then we will have a practice match to learn the interface.
3. Next, there will be a quiz with 10 questions to make sure everyone understands the instructions.
  - All 10 questions will refer to these instructions so you should follow them carefully.
  - If you answer **all questions correctly you will earn \$10.00**.
  - If you answer **at least one question incorrectly you will earn \$0**, at which point you will not need to answer any more questions.
  - You will have 10 minutes to answer the 10 questions.
4. After the quiz, you will have 10 minutes to prepare for the experiment. In the experiment you will be working with a fictitious currency called Francs. You will be paid in US Dollars at the end of the experiment. **The exchange rate today is: 1250 Francs = 1.00 USD.**

## Experiment Details

- This experiment consists of **ten** matches.
- Prior to start of the experiment, all participants may be split into two groups. The groups will stay fixed and you will know the number of participants in your group throughout the experiment.
- At the beginning of each match, you will be paired **randomly** with one other participant from your group. You will remain **matched with this same participant until the end of the match**, but then will be paired with another randomly selected participant from your group in the following match.
- Each match will have the same structure, but may contain different numbers of periods.
- You will remain **anonymous throughout the experiment**. You will not know the identity of the participant that you are paired with, and they will not know your identity. The choices made by you, and the participant you are paired with, have no effect on the payoffs

of participants in other pairs, and vice versa. Therefore, **your payoff in a given match is based solely on the choices made by you and the participant that you are paired with.**

- Next, Let's Look at the experimental Interface

## Specific Instructions for Each Period

- Your payoff in each period will depend on your choice and the choice of the participant that you are paired with.
- You will choose one of two options, either  $W$  or  $Y$ .
- You will be able to see the payoffs for each combination of choices for you and the participant that you are paired with.
- These payoffs will remain the same throughout the entire experiment (all matches).
- The payoffs will be displayed in a table like this:

My Choice	W	W	Y	Y
Other's Choice	W	Y	W	Y
My Payoff	7	3	5	1
Other's Payoff	8	4	6	2
Times Occurred	6	19	6	6

In this example above, the rows are the following:

- Row #1 - Your choice (either  $W$  or  $Y$  in this example)
- Row #2 - Other's choice (either  $W$  or  $Y$  in this example).
- Row #3 - Your payoff.
- Row #4 - Other's payoff.
- Row #5 - Total number of times that that combination has been played **this match**.

### Examples:

- In the table above, if you choose  $W$  and the participant that you are paired with chooses  $Y$ , then you receive a payoff of 3, and the participant that you are paired with receives a payoff of 4. This combination has occurred 19 times so far this match.
- If you choose  $W$  and the participant that you are paired with chooses  $W$ , then you receive a payoff of 7, and the participant that you are paired with receives a payoff of 8. This combination has occurred 6 times so far this match.

- If you choose  $Y$  and the participant you are paired with chooses  $Y$ , then you receive a payoff of 1, and the participant that you are paired with receives a payoff of 2. This combination has occurred 6 times so far this match.

## History

- As the match progresses, you will see the **history** of play across the top of the screen, displayed like this:

23	Period	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
My Choice			W	Y	Y	Y	W	W	Y	Y	Y	W	Y	W	Y	W	Y	Y	Y	W	Y	?
Other's Choice			W	Y	W	W	W	W	Y	W	Y	Y	Y	Y	W	Y	Y	Y	Y	W	W	?

- This history displays the period (labeled Period), your choice in that period (labeled **My Choice**), the choice of the participant you are paired with in that period (labeled **Other's Choice**), and the payoff for that period (labeled My Payoff).
- For example, in the above history, in period 39, you played  $W$ , the participant you are paired with played  $Y$ , and you received a payoff of 3.

## Rules

- Rather than directly making choices of  $W$  or  $Y$ , you will develop a set of rules which will automatically make choices for you.
- The set of rules will appear in the middle of the screen.
- You will be able to construct rules using the rule constructor at the bottom of the screen.
- A rule consists of two parts:
  - **Input Sequence** - A sequence of choices made by you and the participant you are paired with.
  - **Output** - A choice to be made by you after the input sequence occurs.
- Some example rules are displayed below:

Y	W	Y	W
Y	W	W	

Rule #2



Y	W	W	W
W	Y	Y	

Rule #3

W	Y	Y
W	W	

Rule #4

- For example, Rule #2 has an input sequence of  $(Y,Y)$ ,  $(W,W)$ ,  $(Y,W)$  and an output of  $W$ . This means that if you have played  $Y$ ,  $W$ , and then  $Y$  in the last three periods, and the participant that you are paired with has played  $Y$ ,  $W$ , and then  $W$ , this rule will lead you to play  $W$  in the next period.

- As play progresses you will develop a set of rules that will be used to make your choices. Play will proceed as follows:
  - Each period, your set of rules will select the choice to be made next period.
  - The rule that will be used to make the choice will be highlighted.
  - The corresponding sequence in the history will be highlighted.
  - A preview of the choice to be made next period will be shown as a lightly colored cell on the history of play.
  - In order to move to the next period, **you have to confirm the choice by clicking on the corresponding history cell.** Once you have confirmed your choice, the light color will turn to a regular color, and you may need to wait for the participant that you are paired with to make their choice.
- There are several ways that you can modify your rules during the experiment.
  1. First, you can use the rule constructor in the bottom center of the screen. Press the plus button to add more columns, or one of the minus buttons to subtract columns. Click on the question marks to fill in the boxes. When you click on a question mark, either a *W* or a *Y* will appear. If you click on a *W*, it will switch to a *Y*, and if you click on a *Y*, it will switch to a *W*. Once you have completely filled in the rule (leaving no question marks), the **add rule** button will appear, and the rule can be added to your set.
  2. Second, if you look at a rule in the set, you will notice a green copy button, and a red delete button. If you press the green **copy button** () , it will copy the rule down to the constructor, and you will be able to create a similar rule. If you press the red **delete button** () , it will delete the rule from the set.
  3. Since your rule set needs to make a single choice each period, it is not possible to have two rules with the same input sequence, but with different outputs. If you create a rule that has the same input sequence but a different output, you will get an error that says “**Conflicting rule in set**”, and a button that says “**Switch Rule**” will appear. If you press this button, it will delete the conflicting rule from the rule set, and add the rule from the constructor.
- The **length of the rule** is measured by the length of the input sequence.
- So rule #2, and rule #3 have a length of 3, and rule #4 has a length of 2.
- A rule of length  $n$  is said to **fit the history** if the input sequence matches the last  $n$  periods of the history.
- For example, since the last three periods of play in the above history (periods 42-44) have been (*Y, Y*), (*W, W*), and (*Y, W*), and that sequence is also the input for rule #2, then rule #2 is said to fit the history. Similarly, given the above history, we can see that rule #4 fits the history, but rule #3 does not fit the history.
- If more than one rule fits the history, then the **rule with the longer length will determine the choice.**
- For example, given the above history since both rule #2, and rule #4 fit the history, rule #2 will be used to make your choice, since it is longer. Therefore, given the history, and the rule set, your choice next period will be *W*, as prescribed by rule #2.

- If no rules fit the history, then your **Default Rule** will be selected. The default rule will only be used when no rules fit the history. To select your default rule select either *W*, or *Y*, in the bottom left of your screen.
- Additionally, you have to select the **First Period** rule. The first period rule will only be used in the first period of the match. To select your first period rule select either *W*, or *Y*, in the bottom left of your screen.

### Additional Examples

Period	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
My Choice	W	W	W	Y	W	Y	W	Y	Y	W	Y	W	W	W	Y	W	W	W	W	W	W	?	?	?
Other's Choice	W	W	W	Y	W	Y	W	Y	W	Y	W	Y	W	W	Y	W	W	Y	W	W	?	?	?	?

Default Rule	Rule #4	Rule #7	Rule #9
<div>Y</div>	<div>W</div> <div>Y</div> <div>W</div>	<div>Y</div> <div>Y</div> <div>Y</div>	<div>W</div> <div>W</div> <div>W</div> <div>Y</div> <div>W</div>
Last: 5 Total: 9	Last: 3 Total: 3	Last: 7 Total: 5	Last: 2 Total: 4

Click To Confirm

- In the example above, Rule #4, and Rule #9, both **fit** the history. However, rule #9 will be selected because it is longer. Therefore, *W* will be played in the next period, as prescribed by rule #9.
- For the example above, how can we change the rule set to ensure that *Y* is played next period. There are several ways to make changes to the rule set in order for *Y* to be played. First, you can **delete (X)** Rule #9, which would cause Rule #4 to be the longest rule that fits the history, and therefore would lead to *Y* being played next period. Second, you can **add a longer rule that fits the history** that has *Y* as the output. Since you added a longer rule that fits the history, that rule will be used to make the choice, and will select *Y* as the choice for next period.

### Number of Periods Per Match

- The number of periods in each match will be determined randomly using the following procedure.
  - At the end of each period, a number will be chosen randomly from the set of numbers  $\{1, 2, 3, \dots, 48, 49, 50\}$ , where **each number is equally likely**.
  - If the number is 1, then the match will end.
  - If the number is not 1, then the match will continue.
  - The number will always be placed back into the set after it is drawn.
  - Thus, in any period there is a 2% CHANCE that the match will end, and a 98% CHANCE that the match will have another period.
  - Therefore, the expected number of periods in each match will be 50.
  - This procedure has been performed on the computer before the experiment. Therefore, you will not see the number selected from  $\{1, 2, 3, \dots, 48, 49, 50\}$ .

- To ensure that the length of the match is not dependent on your play, the number of periods for each match has been written on the board before the experiment, and will be uncovered at the end of the experiment.

- Your choices will be determined automatically from your rule set. However, **you will need to confirm the choice within an allotted amount of time.** To confirm your choice, click on your action for the next period within the history at the top of the screen. If you don't confirm the choice within the allotted amount of time, then the choice will be confirmed automatically at the end of the allotted time. **The experiment will not be able to proceed until everyone confirms their choices.**

- Everyone in your group will have the same amount of time allotted in each period.

### Additional Information about Matches

- During matches 1-10 you will be able to construct the set of rules to make your choices.
- All of the rules in your set at the end of one match will remain in your set at the start of the next match.
- Before the first match, you will have 1 minute to look over the payoffs, and an additional 10 minute to construct your rules.

### Editing your set of rules

- In the experiment today you will need to **pay a cost to edit rules during the match.**
- More specifically,
  - **Before each match starts,** you can make changes to your set of rules at no cost.
  - **After each match starts,** if you want to make changes to your set of rules, you must click the “**Unlock Rules**” button. The **cost** for clicking the “Unlock Rules” button is **0 Francs**. The total cost incurred in all matches will be displayed at the top of the screen in red. **You will be able to edit your rules for the duration of one period.** Once you are done editing your rules you may click the “**Lock Rules**” button.
  - If you don't want to make changes to your set of rules, you may choose not to click the “**Unlock Rule**” button. Then you will not incur the cost of 0 Francs.
  - In either case, **you will need to confirm the choice made within the time limit set for each period.**
  - If the time limit within a period is reached, your rules will become locked, your choice will be confirmed automatically, and you will proceed to the next period.

### Starting Rules

- Prior to the start of the experiment **you will have 10 minutes** to construct your starting set of rules.
- During that time, you will be presented with a split-screen view of the construction screen. In this view, you will have an opportunity to test what your rule set will select as an output for a variety of **hypothetical histories**.

- The split-screen will consist of two sides. The right side is the **Starting Rules** side. Rules added to this side will be added to your rule set at the start of the first match. The left side is the **Hypothetical Rules** side. Rules added to this side can be used to test to see what choices different combinations of rules will lead to.
- You will be able to move rules from the Hypothetical Rules side to the Starting Rules side by clicking the blue **move** (→) button. To delete rules from either side, you need to click the **delete** (X) button.
- You will be able to see what choice your hypothetical, and your starting rule sets select as a choice for next period, for each of the **hypothetical histories that you construct**.
- Notice that you will be able to construct, and store, **multiple histories** at the same time. You can view one of the other hypothetical histories by clicking the **History #** button at the top of the Hypothetical Rules side. You can add a new hypothetical history by clicking the **New** button at the top of the Hypothetical Rules side.
- To construct a hypothetical history you will need to click on the question marks in that history. You don't need to fill out the entire history to see what choice your rule set will make. Therefore, it is useful to start filling out the new histories from the most recent periods on the right side.

The screenshot displays two side-by-side panels. The left panel, titled 'Hypothetical Rules', features a grid for 16 periods. History 4 is selected, showing 'My Choice' as 'W' in period 15 and 'Other's Choice' as 'Y' in period 15. Below the grid, a text box states: 'With History #1, Rule #0 will be selected and will play W next period.' The right panel, titled 'Starting Rules', also has a 16-period grid. Rule #1 is selected, showing 'My Choice' as 'Y' in period 1 and 'Other's Choice' as 'Y' in period 1. Below the grid, a text box states: 'With History #1, Rule #1 will be selected and will play Y next period.'

- Let's look at an example. Five periods of hypothetical History #4 have been filled in. The hypothetical rule set will play W after this history occurs. The starting rule set will play Y after this history occurs.

The screenshot displays the same two side-by-side panels as before. In the 'Hypothetical Rules' panel, History 4 now shows 'My Choice' as 'W' in periods 1 through 5, and 'Other's Choice' as 'Y' in periods 1 through 5. The text box below the grid now states: 'With History #1, Rule #1 will be selected and will play Y next period.' In the 'Starting Rules' panel, Rule #1 is still selected, showing 'My Choice' as 'Y' in period 1 and 'Other's Choice' as 'Y' in period 1. The text box below the grid remains: 'With History #1, Rule #1 will be selected and will play Y next period.'

222	• Let's look at another example. 14 periods of hypothetical History #3 have been filled in. The	222
223	hypothetical rule set will play <i>Y</i> after this history occurs. The starting rule set will play <i>Y</i>	223
224	after this history occurs.	224
225	• You will be able to make changes to your Hypothetical Rules, and your Starting Rules, for	225
226	the duration of the 10 minutes. <b>After the ten minutes are up, rules that are on the</b>	226
227	<b>Starting Rules side will be your starting rules for the experiment.</b>	227
228	<b>Payoffs</b>	228
229	• At the end of the experiment, you will be paid in <b>cash</b> .	229
230	• Your payoff at the end of the experiment will be the sum of the payoffs for each period.	230
231	• Reminder, the exchange rate today is 1250 Francs = 1 dollar.	231
232	<b>Practice Match</b>	232
233	• Next, there will be a practice match to make sure that you are comfortable with the interface.	233
234	• It is important to note that in this practice match,	234
235	– you will NOT be paid for the choices made.	235
236	– the payoffs are all listed as 0, so that you can focus on getting comfortable with the	236
237	interface, rather than focusing on the payoffs.	237
238	– You are NOT paired with another participant. Your opponent for the practice match is	238
239	a computer that is playing RANDOMLY.	239