



Instructor's Guide to Money Illusion and Price Adjustment

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



Revised edition | October 2026

<https://beer-lab.org/>

How to use this guide

This guide supports the preparation, implementation, and classroom discussion of the family of money-illusion and price-adjustment games prepared through the Behavioral and Experimental Economics Research Lab (BEER Lab) at the Department of Economics of Tecnológico de Monterrey. It is intended for instructors with different levels of familiarity with experimental and behavioral economics.

The document offers three reading paths. The **quick guide** is enough to launch a session. The operational chapters explain each screen used by instructors and students. The conceptual chapters present the theories, predictions, and empirical findings needed to lead the post-game discussion.

Access instructions and common screens are explained once. Each variant then focuses only on what changes relative to the basic game: configuration, group size, decisions, predictions, relevant outcomes, and academic literature.

Author

This guide was prepared by Stanislaw Maldonado, research professor in the Department of Economics at Tecnológico de Monterrey, Monterrey Campus. For questions or suggestions about its content, please contact the author at stanislao.maldonado@tec.mx.

For the instructor

This guide follows the English-language interface. Spanish configurations use the same logic. Never project individual codes or connect outcomes to names, student identification numbers, or seats in the room.

Contents

How to use this guide	i
1 Preparing the class and accessing the game	1
1.1 Access through the updated laboratory website	1
1.2 Family summary	6
1.3 Teaching question and scope	7
1.4 Choosing a configuration before admitting students	7
1.5 Participants, timing, and materials	8
1.6 Institutional navigation and route status	8
1.6.1 Canonical product routes	9
1.7 Creating a session and distributing access	9
1.8 Assignment and comparison across conditions	9
1.9 Operational rehearsal and attendance contingencies	10
2 The participant experience	11
2.1 Opening screen and neutral rules	11
2.2 Instructions and common information	11
2.3 Nominal units and the ECU score	13
2.4 Comprehension questions and correction	15
2.5 Estimate, price, and validation	15
2.6 Waiting, synchronization, and results	17
2.7 Scale change and explicit completion	18
3 Economic model and worked examples	22
3.1 Variables, scale, and relative price	22
3.2 Others average and reference price	22
3.3 Score function and best response	23
3.4 Unique equilibrium and complementarity	23
3.5 Complete example before and after the change	24
3.6 Expectations and retaining the previous price	24
3.7 Classroom adaptation and configurable parameters	24
4 Extensions and teaching comparisons	26
4.1 Map of the sixteen extended conditions	26
4.2 Nominal and real displays with negative change	27
4.3 Positive change and adjustment asymmetry	27
4.4 Constant scale as a learning control	27
4.5 Strong complementarity and independence	28
4.6 Strategic substitutes and responses to extremes	28
4.7 Unit converter and automatic companies	29
5 Private report and interpretation of results	31

5.1	Progress and controlled revelation	31
5.2	Relative-price distribution and evolution	31
5.3	Three distances and forecast error	34
5.4	Descriptive anchoring and confirmed convergence	36
5.5	Payments, losses, and limits of welfare interpretation	36
5.6	Statistical units and careful comparisons	36
5.7	Feedback script and connection to macroeconomics	37
6	Exercises, data, and continued teaching use	38
6.1	Class sequence and allocation of time	38
6.2	Conversion and scoring exercise	38
6.3	Expectations and substitution exercise	39
6.4	Export and data dictionary	39
6.5	Common problems and instructor responses	40
6.6	Primary evidence and interpretation debate	40
6.7	Updating, publication, and future use	41

List of Figures

1.1	Current institutional website. Select CLASSROOM in the top navigation menu to open the teaching experiments. Captured on October 7, 2026.	2
1.2	Current catalog: search by title, topic, or JEL code. Then locate this family's card and select language and edition. Captured on October 7, 2026.	3
1.3	Demo contains only the configurations of this game family, in both languages and editions. Continuation 1/2.	4
1.5	Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.	5
1.6	Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.	6
2.1	Participant opening screen and neutral rules.	12
2.2	Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 1/2.	13
2.4	Current comprehension check with an incorrect answer, its specific explanation, and retained responses.	16
2.5	Estimate and price in the basic option.	17
2.6	Waiting appears only in human conditions.	18
2.7	Individual result in the assigned presentation.	19
2.8	Reminder of the announced change before period six.	20
2.9	Explicit completion and ECU total.	21
4.1	Converter that does not recommend a choice.	29
4.2	Transparent rule for automatic companies.	30
5.1	Report without data: revelation remains disabled.	32
5.2	Partial progress and hidden aggregate results.	33
5.3	Report indicators with defined denominators.	34
5.4	Histogram and relative-price evolution after revelation.	35

Preparing the class and accessing the game

1.1 Access through the updated laboratory website

Start at <https://beer-lab.org/en/>. Select **CLASSROOM** in the top navigation menu; it opens <https://teaching.beer-lab.org/en/>. In the **Classroom experiments** catalog, use the search box to locate the activity by name. You can also filter by **Topic** or **JEL code**. Clear any filters left from an earlier search before looking for another game.

Each family's card distinguishes **Español** and **English** access links. The **Show extended version** checkbox selects that edition before following a link. Catalog language and session language are separate choices: verify both. Students use the room specified by the instructor; the instructor prepares and monitors the session through this family's own administrative pages.

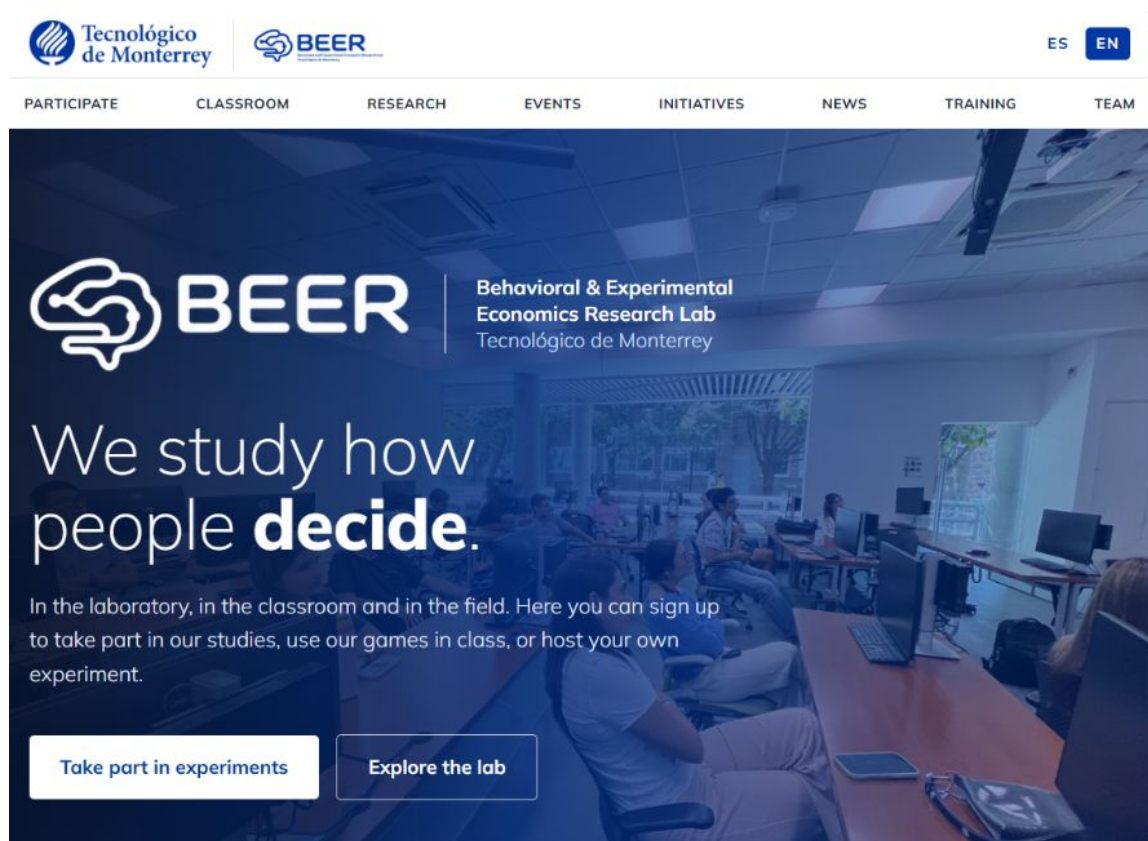


Figure 1.1: Current institutional website. Select CLASSROOM in the top navigation menu to open the teaching experiments. Captured on October 7, 2026.



Figure 1.2: Current catalog: search by title, topic, or JEL code. Then locate this family's card and select language and edition. Captured on October 7, 2026.

Checking resources, comprehension, and participant requirements

Before opening the room, check the selected configuration and the number of students present. The session-creation form states the group size and minimum required by that configuration. An individual activity accepts any positive participant count; an interactive activity must satisfy its stated requirement: complete groups when size is fixed, or a minimum participant count when size is flexible. Requirements may change across treatments, for example when adding a third party or changing an institution's size. If you edit a grouping parameter, check the requirement for the edited configuration, rather than relying only on the demo's suggested count.

In the instructions, ensure that students can identify what each role receives, what they can decide, and how the outcome is calculated. An initial account, a distributable budget, and final earnings need not be the same amount. Refer to the resources panel and the example for the selected treatment. Do not carry the basic edition's endowment into a treatment that changes accounts or introduces additional positions.

ECU stands for *Experimental Currency Units*: the activity's unit of account. An outcome of 100 ECU does not automatically equal 100 pesos or 100 dollars. Conversion depends on the session configuration. Before announcing a payment, confirm with the laboratory whether money is paid, the conversion rate, and which decisions count for payment. In hypothetical modules, describe amounts as outcomes in the stated situation.

When a comprehension check is included, an incorrect response receives an explanation beside that question, identifying the submitted answer and the correct answer. Other answers remain in the form. Ask the student to return to the example, locate the relevant rule, and redo the calculation before correcting the response. Avoid revealing answers to the entire class for an individual error, and do not interpret a comprehension mistake as an economic choice in the game.

ión	Ilusión monetaria y ajuste de precios / Money Illusion and Price Adjustment — BEER Lab Seleccione una variante de este juego. Select a version of this game.
grupo fijo	
grupos reasignados	
tion	
fixed group	
rematched groups	
nominal, cambio negativo	
cambio negativo	
cambio positivo	
cambio positivo	
escala constante	
constante	
complementariedad fuerte	
complementariedad fuerte	
precios independientes	
independientes	
substitución estratégica	
substitución estratégica	
inversor de unidades	
inversor de unidades	
acciones automáticas	
acciones automáticas	
nominal, negative change	4
negative change	
positive change	
percentage change	
constant scale	
constant scale	
strong complementarity	
strong complementarity	
weak complementarity	
weak complementarity	

	ecios independientes
BE	independientes
	stitución estratégica
	ción estratégica
	nversor de unidades
	or de unidades
	ipresas automáticas
	ias automáticas
	ominal, negative change
	ve change
	sitive change
	e change
	nstant scale
	nt scale
	ong complementarity
	complementarity
	dependent prices
	ndent prices
	ategic substitutes
	pic substitutes
	it converter
	inverter
	tomatic companies
	atic companies

Figure 1.4: Demo contains only the configurations of this game family, in both languages and editions. Continuation 2/2.

Rooms

Current rooms:

[ES] Ilusión monetaria: básica
[EN] Money Illusion: basic
[ES] Ilusión monetaria: extendida
[EN] Money Illusion: extended

Figure 1.5: Rooms contains the four rooms for this family: basic and extended editions in Spanish and English.

Room: [EN] Money Illusion: basic

Create a new session

Human companies: groups of four. Use at least eight people for meaningful rematching.

Session Config

[EN] One interaction

Number of participants

Use a multiple of four participants.

Create

[Configure session](#) 

App sequence

money_illusion_game (10 rounds)

Money illusion, strategic interaction, and price adjustment: bilingual hybrid design.

Figure 1.6: Session-creation form for the basic English room. Check the selected configuration and participant requirement before creating the session.

Downloading a session with several rounds

For the instructor

Open **Data** within the relevant session and use that session's CSV or CSV-for-Excel download link. The general export has one row per participant and columns for the different rounds. Ten rounds do not necessarily mean ten rows per person. When the family provides its own long-format export, observations may instead be organized by participant and round or another unit defined by the design.

Save the original file together with the configuration name, session code, and active-round count. Check that columns for the last active round are present and that the data belong to the selected session. Empty cells can represent inactive rounds, a pending decision, or a field that does not apply to a role; do not automatically recode them as zeros. To compare learning, preserve round and group identifiers alongside participant identifiers. Share only anonymous aggregates in class, and record session incidents before constructing derived tables.

1.2 Family summary

Purpose	Distinguish nominal representation, expectations, and price adjustment after an announced scale change.
Experimental unit	Four human companies; individual controls with three automatic companies.

Basic edition	One interaction; ten fixed-group periods; ten rematched periods. Nominal display.
Extended edition	Sixteen conditions per language: eight nominal/real pairs, including the reference.
Decision	Nominal price and forecast of the others average, both between zero and 4m.
Payoff	Up to one hundred ECU per period under default parameters. Total in ECU.
Suggested duration	30–40 minutes for one interaction; 50–70 for ten periods and discussion.
Participants	Multiples of four in human sessions; at least eight for meaningful rematching. Any positive count in individual controls.
Topics	money illusion; nominal prices; real prices; expectations; strategic complementarity; price adjustment.
JEL	A22; C91; C92; D84; D91; E31.
Author and contact	Stanislao Maldonado; stanislao.maldonado@tec.mx.

1.3 Teaching question and scope

The central teaching question is why a price may adjust slowly when everyone knows that nominal quantities will change scale. One possible explanation is difficulty interpreting numbers expressed in different units. Another is that a company expects the other companies to retain their previous prices and responds to that expectation. The activity separates these explanations conceptually through nominal and real displays, different forms of interaction, and individual controls. Each participant chooses a price and reports an estimate of the other companies' average; participants do not sell goods or choose a central-bank interest rate.

The activity introduces a mechanism absent from the public catalog checked on October 4, 2026. Bank runs concern withdrawals and liquidity, credit markets concern lending contracts, and monetary-policy activities ask for central-bank decisions. Here the main experimental unit is four companies setting prices simultaneously. The earlier investment-coordination family also differs: no capital is invested, and this game has a unique relative-price benchmark rather than several coordination equilibria.

Prepare the discussion around choices, beliefs, and units. A comparison between two small classroom groups can help formulate explanations and assess their consistency with theory. It cannot, by itself, estimate a general effect for an economy. Finding little difference between conditions can also provide a useful learning outcome. Ask students to explain both differences and similarities using the actual rules.

Checkpoint

Before admitting students, verify condition, language, horizon, and a multiple of four. One interaction cannot measure inertia after a scale change.

1.4 Choosing a configuration before admitting students

The basic options are one interaction, ten periods with a fixed group, and ten periods with random rematching. All three use the nominal display and moderate complementarity. The

single interaction keeps the scale at one hundred and introduces best responses; it provides no observations following a scale change. In the ten-period conditions, the first five periods use one hundred and the last five use fifty. This schedule is announced at the outset, so the change is anticipated.

Fixed groups allow the instructor to follow the same four companies. Rematching forms new groups of four each period and helps discuss learning when the social environment changes. With only four participants, the other companies cannot actually change; use at least eight for that comparison. Repeat encounters remain possible because the random rule does not forbid previous partners. Interactive extensions use fixed groups to preserve interpretable paths, whereas the automatic-company controls are individual activities.

Select the teaching question before selecting a menu option. For an introductory class, fixed groups and the real negative-change condition provide a direct comparison. To study strategic substitution, compare conditions with the same display and change only the interaction coefficient. Avoid changing language, interaction, and the sign of the scale change together if you later wish to attribute an observed difference to just one component.

1.5 Participants, timing, and materials

Human sessions require attendance in multiples of four. Eight people provide two groups and meaningful rematching; twelve provide three groups, although the number of independent units remains small. Automatic-company conditions accept any positive number of people: each controls one company against three programmed companies. Those companies do not occupy computers, do not provide human choices, and never enter the participant count. A class of twenty people should not be described as twenty independent groups when participants interact in groups of four.

Allow approximately thirty to forty minutes for a single interaction with discussion and fifty to seventy minutes for ten periods. These are planning estimates, not measured pilot durations. Allocate time for reading the rules, checking conversion, and discussing the change afterward. If students have limited mathematical preparation, work through an example outside the session that does not tell them which price to choose during the incentivized activity.

Each participant needs a browser connected to the chosen instance. The instructor needs administrative credentials and a display for the aggregate report. Prepare the room link, a worksheet for the later exercise, and a procedure for late arrivals. Announce beforehand whether ECU are illustrative points, part of an assessed activity, or convertible into money. The application does not choose that conversion and does not collect demographic information.

1.6 Institutional navigation and route status

Institutional navigation begins at beer-lab.org, through the teaching-and-students section toward teaching.beer-lab.org. This family's catalog card has been prepared in repository metadata so that the laboratory panel can incorporate it after deployment. The canonical addresses in this guide are the proposed product routes. Their appearance in the document does not mean that the domain has already been published. Until deployment is completed, use the verified local instance and do not announce a public address as available to students.

The instructor address ends in Demo and requires authentication. Rooms contains exactly four rooms for this family: basic and extended, in Spanish and English. Each basic room lists only its three basic options; each extended room lists sixteen conditions. A room's name is the literal prefix of its session configurations. This convention prevents an accidental switch to another family

or language.

The localhost address works on the computer that runs the server. Other classroom devices cannot use that address to reach this computer. A session spread across devices needs institutional deployment or a network address configured for that purpose. Keep a record of the selected routes and test access using the kind of device students will use. Verify the language and condition after signing in rather than relying on a saved browser tab.

1.6.1 Canonical product routes

<https://beer-lab.org/>

<https://teaching.beer-lab.org/>

<https://moneyillusion.beer-lab.org/demo>

https://moneyillusion.beer-lab.org/room/money_illusion_en

https://moneyillusion.beer-lab.org/room/money_illusion_extended

Local preview on this computer: <http://localhost:8084/demo>.

1.7 Creating a session and distributing access

Sign in to the family panel, open Rooms, and select the desired language and edition. Confirm the configuration name and participant count before creating the session. An interactive session with six people cannot form groups of four; the system should reject it rather than leave two people waiting. An automatic-company session with six people is valid because it creates six individual episodes. If the comparison uses fixed groups and a real display, create separate sessions and record how each group was assigned.

After creating the session, keep Monitor and Report in separate tabs. Individual start links belong to participants and should never appear on a projected display. Share the room address or allocate the links without allowing two students to use the same one. Opening another tab with the same link does not create another person and may interfere with the original participant's progress. Administrative names in the monitor should not be transferred to the discussion report.

Check that everyone has reached the opening screen before asking students to read. Human companies synchronize within their group after submitting a decision, not while reading each paragraph of the instructions. One group can therefore advance faster than another. Do not interpret this asynchronous progress as abandonment, and do not announce aggregate averages while other groups are still choosing.

1.8 Assignment and comparison across conditions

A useful teaching comparison changes the feature that the class intends to discuss. If one group uses English and another Spanish, a difference may reflect language comprehension. If one group starts after hearing the first group's discussion, available information also changes. When feasible, allocate complete groups randomly to conditions, use equivalent instructions, and allow the same amount of time. In an interactive design, the group is the assignment unit because its members affect one another's payoffs.

The application provides separate configurations. It does not automatically allocate participants to different treatments within one session. The instructor creates the comparison sessions and keeps

an external assignment record. Do not place nominal and real displays inside the same human group without explicitly redesigning the experiment; that mixture would change expectations about the other companies' displays. In automatic-company controls, each person is an individual unit and can be assigned separately.

Avoid turning the comparison into a competition with evaluative group labels. A price near the benchmark does not demonstrate greater intelligence, and slow adjustment does not permanently characterize a person. Use administrative condition names, preserve privacy, and focus discussion on the rules that changed. Balanced assignment and a written protocol are more informative than a causal explanation attached to a difference only after it has been observed.

1.9 Operational rehearsal and attendance contingencies

Rehearse with test links and follow the complete sequence, including the ending. Check that a person without credentials cannot enter the private report and that results are hidden when the report opens. Also verify that the reveal button remains disabled while episodes are missing. Seeing the welcome screen or submitting a price is insufficient: the rehearsal should include results, the scale-change screen when applicable, and the final page. The screenshots in this guide come from synthetic sessions created for that check.

Handle absences by revising attendance before creating a session. If someone stops responding after the activity begins, that person's human group may remain on a wait page and the report will not enable complete revelation. The program does not fabricate a substitute choice or automatically assign zero. If the session must be abandoned, explain the incident, preserve its record, and create a new session with valid group composition. Do not combine incomplete periods with another session as though they formed one continuous path.

A late arrival cannot become a fifth company in an existing group. That student can join a later session or complete a separate individual control if doing so fits the lesson. Distinguish participation recovery from experimental comparison: switching someone to automatic companies because time is short does not amount to random assignment to a treatment.

The participant experience

2.1 Opening screen and neutral rules

The opening screen presents a price activity, the laboratory institutions, and general rules. It does not announce that money illusion is being measured or state a behavioral hypothesis. This neutral presentation prevents the construct's name from becoming an instruction about what to choose. Participants confirm that they have read the rules before continuing. The instructor may explain that the activity concerns economic decisions and points, while reserving behavioral interpretations until the activity ends.

The rules ask students to decide individually, avoid sharing their links, and follow the instructor's announcement about ECU. The screen does not provide research consent for a separate study or promise remuneration that has not been defined. If the class belongs to another research project, its institutional procedures must be handled separately. No age, gender, student identification, or political-affiliation questions are added; none is needed to set a company price.

Use a short introductory script: each person controls a company, provides an estimate, and chooses a price within the permitted interval. Avoid telling students to "adjust correctly" or "avoid being fooled by nominal numbers," because these statements reveal the outcome the instructor considers desirable. Check comprehension without suggesting behavior, and keep the spoken explanation equivalent across the conditions being compared. A neutral start also makes later disagreement easier to discuss without blaming students.

What participants will see

Participants see a price activity with neutral rules. In automatic controls they know the three companies use a function; the companies are not presented as real students.

2.2 Instructions and common information

The instructions identify who controls the other companies, the matching procedure, and the number of periods. In human conditions, three participants choose at the same time as the focal participant. The focal price is excluded from the others' average. In individual controls, the three companies are automatic and their price rule is written explicitly; there is no uncertainty about an undisclosed human choice. The heading shows the period and horizon, while separate cards display the current quantities.

Everyone knows the score function, interaction coefficient, and scale schedule. Negative-change conditions announce one hundred for the first five periods and fifty for the last five. Positive-change conditions announce one hundred fifty after period five, while constant-scale conditions retain



Period 1 of 1

Price activity

You will set a company price. Your score depends on your choice and the prices of three other companies.

Laboratory rules

1. Read the instructions and decide individually. Do not talk to other people during the activity.
2. Do not share your link or reload a decision after submitting it. Each link belongs to one person.
3. Points are expressed in Experimental Currency Units (ECU). Any conversion to money or grades will be announced by the instructor before starting.

☐ I have read the rules and am ready to continue.

Continue

Figure 2.1: Participant opening screen and neutral rules.

one hundred. The information is common, but knowing the rule does not ensure that everyone interprets it equally or expects the others to interpret it in the same way.

The example table fixes the other companies' average at the current scale and displays several possible own prices. It helps students read the function; it does not describe what the other companies will actually choose. Participants can use the complete formula for a different average. During the decision, a collapsible panel retains the rules and examples, allowing consultation without leaving the page or losing numbers already entered.



Period 1 of 1

How the activity works

Resources and unit of account

ECU stands for Experimental Currency Units. It is the unit of account for this activity.

This session does not convert ECU into real money.

The other three companies are controlled by participants. Everyone chooses at the same time. Your price is excluded from the average of the other companies.

This activity has one period.

Period scale (m)

100.0Conversion factor ($c = m / 100$)**1.0**Interaction coefficient (α)**0.5**

Your ECU score is calculated using these rules:

$$T = \max(0, \min(4m, (1 - \alpha)m + \alpha \times \text{Average of the other companies}))$$

$$\text{ECU} = 100.0 \times \exp(-((p - T) / (0.5m))^2)$$

$$N = c \times \text{ECU}; \text{ECU} = N / c$$

Figure 2.2: Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 1/2.

The table and result display units of account N. Your score is N divided by c. Do not add units of account across periods: only ECU are added.

2.3 Nominal units and the ECU score

Example when the average of the other companies equals m

Your company price

Units of account N

A unit of account expresses an amount through a number and a scale. In this application, N is the amount displayed in the nominal presentation and c is the conversion factor. The experimental payment in ECU equals N divided by c. When c is one half, fifty units N equal one hundred ECU. When c is one and a half, one hundred fifty units N also equal one hundred ECU. A larger nominal number does not automatically mean a larger score.

The nominal presentation displays ECU directly in the example table and the result. Both conditions

200.0	1,832
250.0	0,012
300.0	0.0

The other three companies are controlled by participants. Everyone chooses at the same time. Your price is excluded from the average of the other companies.

This activity has one period.

Period scale (m)
100.0

Conversion factor (c = m / 100)
1.0

Interaction coefficient (a)
0.5

Your ECU score is calculated using these rules:

$$T = \max(0, \min(4m, (1 - a)m + a \times \text{Average of the other companies}))$$
$$ECU = 100.0 \times \exp(-((p - T) / (0.5m))^2)$$
$$N = c \times ECU; ECU = N / c$$

T is restricted to the interval from 0 to 4m. The average includes only the other three companies. The maximum score is reached when your price equals T.

The table and result display units of account N. Your score is N divided by c. Do not add units of account across periods: only ECU are added.

Examples when the average of the other companies equals m

Your company price	Units of account N
0.0	1,832
50.0	36,788
100.0	100.0
150.0	36,788
200.0	1,832
250.0	0,012
300.0	0.0
350.0	0.0
400.0	0.0

These are examples, not a recommendation. The actual average may differ.

This estimate does not change your score and is not rewarded separately.

Continue

Powered by [oTree](#)

Figure 2.3: Current instructions for the basic edition: initial resources, decision rules, and experimental units. Continuation 2/2.

explain conversion and share the same economic score function. The emphasized quantity changes; the permitted prices, interacting companies, and payoff from any given choice profile remain the same. This equivalence is essential if an observed difference is to be discussed in relation to representation or the processing of that representation.

The final total adds ECU exclusively after each period is calculated. Never add N across periods with different conversion factors to evaluate performance. Calculations preserve precision before rounding the payment to two decimals; the displayed nominal amount is an informative approximation. If dividing already rounded display values differs from the recorded ECU payoff by a cent, use the recorded payment instead of repeatedly rounding intermediate components. The class should compare purchasing units rather than the visual size of a number.

2.4 Comprehension questions and correction

The comprehension questions check two rules: the average contains three companies and excludes one's own company, and units N must be converted to ECU before payments are added. An incorrect answer returns a prompt to review the instructions. It does not consume a period or reduce the score. The aim is to prevent a display comparison from becoming a comparison between people who received different rules or overlooked a basic instruction.

Do not add a question requiring the optimal price before students enter the activity. Solving that problem first can directly teach the behavior that the subsequent choices are intended to reveal. The instructor can help students locate the conversion factor or explain how to average three numbers, but should provide the same assistance across conditions. Note whether additional explanation was needed, since that intervention can affect interpretation of the choices.

Someone who answers correctly may still struggle with the exponential function or expectations. Understanding the rules does not imply perfect optimization. Afterward, distinguish conversion mistakes, forecast errors, and departures from a best response. The report supports that distinction, but a comprehension answer is not a complete measure of economic knowledge. Use the questions students raised to choose later discussion examples, without publicly identifying the people who raised them. This also separates operational support from feedback about behavior.

2.5 Estimate, price, and validation

The decision screen first asks for an estimate of the nominal average of the other three companies and then for the participant's own price. Both numbers must be finite and lie between zero and four times the current scale. Decimal prices are permitted; participants are not restricted to an integer grid. Browser validation helps catch input mistakes, while server validation enforces the same bounds again. A missing, negative, infinite, or out-of-range quantity is not a valid choice.

The estimate does not affect payment and is not rewarded separately. This keeps a single source of scoring but limits the interpretation of forecasts: someone can report an approximate or poorly considered number without an additional monetary cost. Describe it as a reported expectation rather than an incentivized belief elicited with a scoring rule. The relationship between price and forecast can be used to examine consistency, but it does not prove that the forecast caused the choice.

When the scale falls, the nominal upper bound also falls, from four hundred to two hundred in negative-change presets. The relative interval remains zero to four. With a scale of one hundred fifty, the upper bound becomes six hundred. These changes preserve comparable relative opportunities and are disclosed before decisions. They should not be interpreted as regulatory price controls or



Review the marked questions. Each shows your answer and an explanation; your other answers are retained.



Period 1 of 1

Check the rules

Resources and unit of account

ECU stands for Experimental Currency Units. It is the unit of account for this activity.

This session does not convert ECU into real money.

How many other companies enter the average?

- ☐ Three companies; your own is excluded.
- ☒ Four companies; your own is included.

Your answer: Four companies; your own is included.. The correct answer is Three companies; your own is excluded..
Review the average of the other three companies and the ECU conversion.

How is the ECU score obtained?

- ☒ Divide N by c; add ECU from all periods.
- ☐ Add the units N without converting them.

Continue

Powered by [oTree](#)

Figure 2.4: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.

unexpected restrictions imposed during the activity.



Period 1 of 1

Your decision

Period scale (m)

100.0

Conversion factor ($c = m / 100$)

1.0

Interaction coefficient (α)

0.5

Enter numbers between 0 and 400.

Your estimate of the average price of the other three companies

100

This estimate does not change your score and is not rewarded separately.

Your company price

85

► How the activity works

Continue

Figure 2.5: Estimate and price in the basic option.

2.6 Waiting, synchronization, and results

In a human session, a company that submits its choice reaches a wait page until the other three companies in its group have chosen. Waiting prevents someone from observing the realized average before submitting a price. Once the group is complete, the application calculates its four payments once and releases the result pages. A fast group does not need to wait for every other classroom group, although the instructor report keeps aggregate outcomes hidden until the session is complete.

The automatic-company control has no wait page. The human choice determines the three automatic prices through the disclosed response rule, allowing immediate payment calculation.

Do not simulate a delay by other students or describe the automatic companies as connected people. Participants must know clearly that they are interacting with a function. This operational difference reflects a different experimental unit, rather than a synchronization error.

The period result displays the own price, the other companies' average, and the score in the assigned presentation. The nominal version also displays the ECU conversion. It does not label the chosen price as correct or incorrect or recommend a later choice. Participants can learn from their experience, but theoretical interpretation belongs in the final feedback, after discussion can no longer influence pending decisions. Distinguish that individual feedback from the instructor's controlled aggregate revelation.



Period 1 of 1

Waiting for the other companies

Your decision has been recorded. Your result will be available when the other companies in your group submit their choices.

Figure 2.6: Waiting appears only in human conditions.

2.7 Scale change and explicit completion

In period six of conditions with a scale change, a reminder screen displays the new scale, conversion factor, and interaction coefficient. It does not use the word inflation or attribute the change to a particular policy. It does not revise the announced schedule. Its purpose is to provide the information needed to act and prevent a unit change from being missed because of an interface problem. Constant-scale conditions omit this screen because there is no change to announce.

After the final active period, each participant reaches an explicit activity-completed page. It displays the ECU total and a table containing period, scale, nominal price, relative price, and payment. There is no button for another submission and no generic ending saying that no pages remain. In the single-interaction option, completion follows the first result even though the application reserves ten technical periods for other configurations.

Ask students to keep the final screen open while the discussion is organized. Do not project an individual table or associate its rows with names. Students can consult their own experience when answering questions, but the class should see aggregate distributions only. Relative prices appear at completion to support learning; the difference between presentations during decisions has already been preserved. This timing helps explain why final educational feedback and treatment information are handled differently.

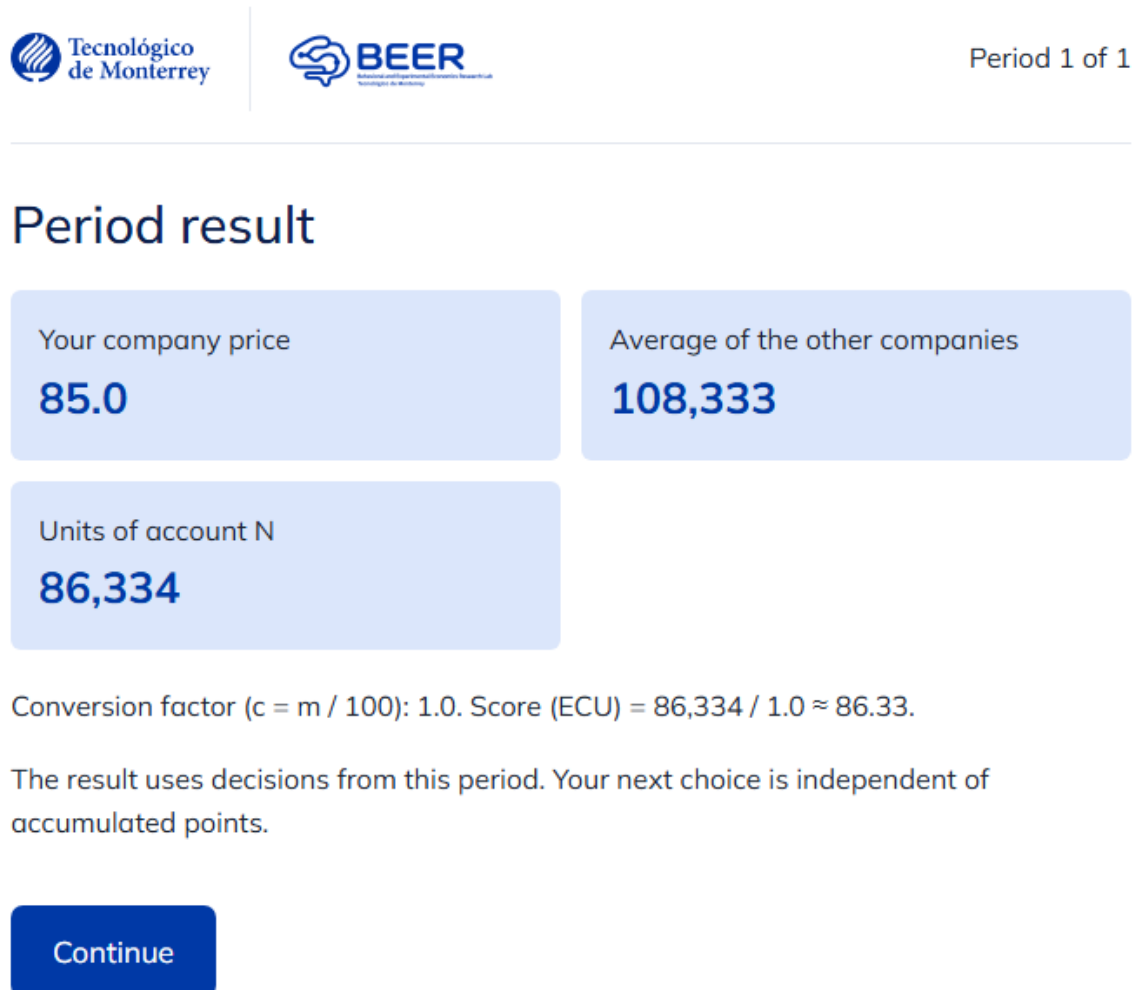


Figure 2.7: Individual result in the assigned presentation.



Period 6 of 10

New period scale

Period scale (m)

50.0Conversion factor ($c = m / 100$)**0.5**Interaction coefficient (α)**0.5**

The indicated scale applies from this period onward. Review the conversion factor and permitted range before submitting your decision.

The table and result display units of account N. Your score is N divided by c. Do not add units of account across periods: only ECU are added.

[Continue](#)

Figure 2.8: Reminder of the announced change before period six.



Period 10 of 10

Activity completed

Accumulated ECU total: 904.6

Your participation has ended. Keep this screen open and wait for the instructor.
You do not need to submit anything else.

Period	m	Your company price	p/m	ECU
1	100.0	85.0	0.85	90.46
2	100.0	85.0	0.85	90.46
3	100.0	85.0	0.85	90.46
4	100.0	85.0	0.85	90.46
5	100.0	85.0	0.85	90.46
6	50.0	42.5	0.85	90.46
7	50.0	42.5	0.85	90.46
8	50.0	42.5	0.85	90.46
9	50.0	42.5	0.85	90.46
10	50.0	42.5	0.85	90.46

Figure 2.9: Explicit completion and ECU total.

Economic model and worked examples

3.1 Variables, scale, and relative price

The chosen price is denoted p , and the current scale is denoted m . Relative price q equals p divided by m . In the presets, m starts at one hundred, then may fall to fifty, rise to one hundred fifty, or remain at one hundred. The permitted nominal interval runs from zero to four m , so q always lies between zero and four. Comparing relative prices prevents a unit change from being confused with a change in a company's strategic position.

Consider two profiles: every company chooses one hundred when m is one hundred, or every company chooses fifty when m is fifty. Nominal prices differ, but both profiles have q equal to one and yield one hundred ECU per person under default parameters. This invariance underlies the display comparison. A third profile, choosing one hundred after m falls to fifty, has q equal to two and is not equivalent to the first two profiles.

The scale is exogenous and known. It is not a price index computed from a basket of goods or a money supply determined by classroom decisions. The activity abstracts from demand, sales, and production to focus on representation and expectations. Its concepts can be connected to nominal and real prices in macroeconomics, but explain which model relationships carry over and which economic processes are not represented.

3.2 Others average and reference price

The others' average contains only the three prices chosen by the other companies. If those prices are eighty, one hundred, and one hundred twenty, their average is one hundred. Changing the focal company's price from ninety to one hundred ten leaves that average unchanged. Including the own price would produce a different response formula and alter the interpretation of interaction. This is why the comprehension check emphasizes exclusion of one's own choice.

Reference price T combines the current scale with the others' average. Before clipping, T equals one minus a times m , plus a times the other companies' mean. With a equal to one half, the two components receive equal weight. If m is one hundred and the others' mean is one hundred twenty, T is one hundred ten. If m falls to fifty while the others' mean remains at one hundred, T is seventy-five. The latter calculation explains why a best response can lie above the new common benchmark.

The program clips T to the interval from zero to four m . Clipping matters particularly for negative coefficients and extreme averages, preventing maximization from requiring an inadmissible price. Within the interval, T changes with the others' average at rate a . Outside that region, the bound keeps the response within the permitted choice set.

Theoretical foundation

The best response to a given others average is T . The unique benchmark is $q = 1$. Benchmark distance and distance from realized T answer different questions.

3.3 Score function and best response

The real score follows a Gaussian function: one hundred times the exponential of the negative squared distance between p and T divided by one half m . The function is always positive, approaches zero for large distances, and reaches one hundred when p equals T . There is no endowment of one hundred to which this amount is added; one hundred is the maximum period score. A distant choice produces neither debt nor a negative score.

To maximize against a given others' average, minimize the absolute distance from T . Because T lies within the permitted interval, choosing T attains the maximum. A complicated derivative is unnecessary: a square cannot be smaller than zero, and the exponential of zero equals one. The width of one half m controls how rapidly the score declines away from the reference price, but does not change the location of the maximum.

Prices admit decimals so that best responses can be approximated without imposing a discrete grid that might generate extra fixed points through rounding. The computer uses finite precision and rounds the final payment to cents. The uniqueness statement concerns the continuous model before payment rounding. Several nearby choices can receive the same rounded score without becoming distinct equilibria of the underlying economic model. Explain that practical payment precision and theoretical equilibrium are separate issues.

$$\begin{aligned}\bar{p}_{-i} &= \frac{1}{3} \sum_{j \neq i} p_j, & q_i &= p_i/m, & c &= m/100, \\ T_i &= \max\{0, \min\{4m, (1-a)m + a\bar{p}_{-i}\}\}, \\ U_i &= 100 \exp \left[- \left(\frac{p_i - T_i}{0.5m} \right)^2 \right], & N_i &= cU_i.\end{aligned}$$

3.4 Unique equilibrium and complementarity

In a symmetric profile, every company chooses the same q . When clipping is inactive, the best-response condition is q equal to one minus a , plus a times q . Collecting terms gives one minus a times q equal to one minus a . If the absolute value of a is below one, a cannot equal one, and the solution is q equal to one. The complete best-response vector is also a contraction: a change in other prices alters a response by no more than the absolute value of a times the largest change among others.

Clipping does not amplify distances, so it preserves this property. The model therefore has a unique benchmark even when asymmetric profiles are considered. This proof does not assert that participants will reach the benchmark immediately. Uniqueness describes the model solution; learning, expectations, and information processing describe how behavior may approach it.

With positive a , a higher others' average raises the best response, so prices are strategic complements. With negative a , the response falls, giving strategic substitutes. At zero, the response does not depend on the others' average. This classification differs from complementary or substitute

consumption goods. It describes the slope of a strategic response in the score function, rather than an observed demand elasticity or actual competition for customers.

3.5 Complete example before and after the change

Suppose m equals one hundred and a equals one half. A company chooses ninety and forecasts that the others will average one hundred. Their realized prices are eighty, one hundred, and one hundred twenty. The average is one hundred, T is one hundred, and the nominal distance is ten. Dividing by fifty gives two tenths; squaring gives four hundredths. The score is one hundred times the exponential of minus four hundredths, approximately 96.08 ECU. The forecast has zero error, and the best-response distance is one tenth in units of m .

After a negative change, m equals fifty. If all nominal quantities in the example are halved, the own price becomes forty-five and the others choose forty, fifty, and sixty. T is fifty, and dividing the distance by twenty-five again gives two tenths. Payment remains 96.08 ECU. The nominal presentation now displays approximately 48.039 units N , converted using c equal to one half.

If the company retains ninety while the others halve their prices, T remains fifty and the scaled distance becomes 1.6. Payment falls to approximately 7.73 ECU. This calculation illustrates a loss against that particular profile. It is neither a test establishing money illusion nor a prediction that everyone will make the same choice. Have students reconstruct both conversions before discussing behavioral explanations.

3.6 Expectations and retaining the previous price

Consider period six with m equal to fifty and a equal to one half. If a participant expects the others to average one hundred, the conditional best response is seventy-five. The common benchmark is fifty, but choosing seventy-five can be consistent with maximization against that forecast. If the others actually choose one hundred, the realized T is also seventy-five and the company receives one hundred ECU. Its distance from q equal to one is one half, while its realized best-response distance is zero.

This profile separates three questions. Does the company understand the units? Does its forecast describe what other companies will do? Does it choose consistently with that forecast? A single price measure cannot answer all three. Even an accurate forecast does not demonstrate complete information processing, and a choice equal to T may result from different procedures. The activity records estimates to broaden discussion, rather than definitively identify a mental process.

The report's previous-price proximity measure uses one hundred as the anchor in the presets and a five-percent band. It describes choices, not types of people. Retaining one hundred may reflect persistent expectations, a simple heuristic, calculation difficulty, or a combination of these. Ask students to propose controls that distinguish those possibilities before deciding which explanation appears most consistent with the classroom observations.

3.7 Classroom adaptation and configurable parameters

The family draws on experimental price setting and comparisons of representations, but adapts the protocol for transparent classroom use. It uses symmetric companies, a Gaussian score function, and an exogenous scale conversion. In Fehr and Tyran's 2001 design, nominal deflation depends on others' prices; here N equals m divided by one hundred times the real payment. This difference

prevents describing the application as a literal replication or transferring the article's empirical magnitudes to the classroom.

Configurable parameters include initial scale, later scale, interaction coefficient, payoff width, and maximum score. Presets use a maximum of one hundred ECU and a width of one half m . Validation requires positive finite quantities and an interaction coefficient with absolute value below one. Automatic-company controls require the specified one-half coefficient. Changing parameters creates an additional condition that must be documented, tested, and disclosed with consistent instructions. Do not edit values while a session is running.

Increasing width reduces losses from a given relative deviation without changing the best response. Increasing the maximum scales the scores. Changing the coefficient changes strategic interaction. These modifications have different interpretations and should not all be described as greater difficulty. Preserve the parameter values so payments can be reconstructed and the default product distinguished from a local adaptation.

Attention

Exogenous scale and the Gaussian function are classroom adaptations. Do not describe results as a literal Fehr and Tyran replication or as an economy inflation, GDP, or welfare.

Extensions and teaching comparisons

4.1 Map of the sixteen extended conditions

The extended edition contains eight nominal/real pairs. The pairs cover negative change, positive change, constant scale, strong complementarity, strategic independence, strategic substitutes, a unit converter, and automatic companies. The nominal negative-change condition is called the reference and retains the fixed-group basic mechanism. Sixteen presets therefore do not represent sixteen independent mechanisms. They provide one reference and fifteen additional conditions supporting controlled comparisons.

Their number follows teaching usefulness and adequate specification, without an arbitrary ceiling. Each pair preserves the same economic rule across displays. Scale changes after five periods except in the constant-scale control. Interaction equals one half in the reference, eight tenths with strong complementarity, zero with independence, and minus one half with substitutes. The converter keeps the reference values. Automatic companies change who determines the others' average, while disclosing their response function.

Choose a small subset for a particular class and explain which question each comparison addresses. Including every condition in the package does not require running them all in one lesson. Indexed contracts, wages, and auctions are not added as extensions here: they require different decisions and overlap with mechanisms covered by other families. Their exclusion follows mechanism and comparability, rather than a production phase. Record the chosen comparison before opening the session so that interpretation does not depend on which result looks most striking.

Pair	Values and comparison
Negative change	m: 100 to 50; a: 0.5
Positive change	m: 100 to 150; a: 0.5
Constant scale	m: 100; a: 0.5
Strong complementarity	m: 100 to 50; a: 0.8
Independence	m: 100 to 50; a: 0
Substitutes	m: 100 to 50; a: -0.5
Converter	Reference with auxiliary conversion
Automatic companies	One person, three programmed responses

4.2 Nominal and real displays with negative change

This pair keeps four companies, ten periods, fixed groups, one-half interaction, and a scale reduction from one hundred to fifty. Only the quantity emphasized in tables and results changes. Before the change, c equals one, so nominal and real numbers coincide. Afterward, the same real score appears as half as many units N in the nominal display. The common schedule supports a post-change comparison without introducing a different surprise across conditions.

The fully informed monetary prediction is the same equilibrium relative price and maximum payoff under both presentations. A subsequent difference may be consistent with different processing of units, but it may also reflect different forecasts about the other companies. Examine relative prices, forecast errors, and consistency with responses to forecasts. Do not reduce the analysis to whether nominal prices halved exactly in period six.

For discussion, propose two hypothetical profiles: everyone cuts the price to fifty, or some companies retain one hundred. Calculate best responses in both and compare them with recorded forecasts. The 2001 literature motivates the contrast between representation and aggregate adjustment; the application does not reproduce its function or guarantee its findings. If both groups adjust rapidly, discuss which common information, practice, or assistance may have made the equivalence easy to recognize.

4.3 Positive change and adjustment asymmetry

The positive pair raises m from one hundred to one hundred fifty starting in period six. The nominal benchmark becomes one hundred fifty, c becomes one and a half, and the upper price bound becomes six hundred. The relative benchmark and maximum real payment remain unchanged. The real condition displays one hundred ECU directly, while the nominal condition displays one hundred fifty units N for the same maximum. This preserves the economic meaning of scale without assuming that a larger nominal number means a larger reward.

Compare the direction of relative deviations after negative and positive changes. Retaining one hundred gives q equal to two after a reduction to fifty, but q equal to two thirds after an increase to one hundred fifty. The distances are not symmetric because the preset percentage changes are not symmetric in relative or logarithmic distance. A fifty-percent reduction and a fifty-percent increase have different logarithmic magnitudes. Do not attribute every difference in adjustment speed to psychological asymmetry without acknowledging this parameter choice.

The later money-illusion debate discusses adjustment and competing explanations. In class, the sign comparison raises that question and checks representation. A stronger quantitative comparison would require changes symmetric under the chosen metric, followed by renewed parameter and instruction checks. The default package does not claim to resolve that identification with a small classroom sample.

4.4 Constant scale as a learning control

Constant-scale conditions keep m at one hundred throughout ten periods. There is no change screen, and the conversion factor remains one. Groups stay fixed and interaction remains one half. Nominal and real amounts are numerically identical, although their labels preserve the assigned presentation. This condition allows observation of practice and expectation adjustment without a scale change. It cannot estimate a post-change conversion effect because conversion never differs from one.

If prices also approach q equal to one under constant scale, some evolution in other conditions may reflect general learning about the score function and group members. Compare trends before period six, rather than only final outcomes. The control does not remove every possible difference across sessions: groups may start at different levels, and their schedule instructions differ because one announces a change while another does not.

Previous-price proximity and post-change entry measures are not applicable here. Their absence in the report is not evidence of missing data or a software failure. Means, dispersion, distributions, and payments remain available. Ask students to distinguish a stable scale from stable choices: holding m fixed does not require repeating a price and does not prevent a company from changing after observing the previous period. This control is especially useful when students initially describe every time trend as an effect of the announced shock.

4.5 Strong complementarity and independence

The strong-complementarity pair sets a to eight tenths. With m equal to fifty and the others' average at one hundred, T is ninety: ten comes from the scale component and eighty from the others' average. In the reference, T would be seventy-five. Expectations of persistent prices therefore induce a response closer to the previous nominal amount under stronger complementarity. Equilibrium remains q equal to one, while the mechanism transmits other companies' choices more strongly.

The independence pair sets a to zero. T then equals m regardless of the others' average. Forecasts are still recorded to preserve a comparable sequence, but they no longer matter for maximizing one's own score. If nominal and real displays differ in this condition, strategic interaction cannot be the immediate channel in the payoff function. That observation motivates examining representation, calculation, or comprehension, without automatically identifying one explanation.

These pairs distinguish social uncertainty from economic dependence. Under independence, other people still choose and their average is observed, but their prices do not affect the focal payment. The automatic control removes other human decisions while retaining dependence through a rule. The interventions are different. Explain which component changes before comparing outcomes, and keep the presentation fixed when contrasting coefficients. A greater response to other prices is a theoretical property, whereas slower observed convergence remains an empirical question.

4.6 Strategic substitutes and responses to extremes

The substitutes pair uses a equal to minus one half. Before clipping, T is one and a half times m minus one half times the others' average. With m at fifty and an others' mean of one hundred, T is twenty-five. An expectation of high other prices now induces a best response below the benchmark rather than a high own response. Reversing the slope shows how the same expectation is transmitted differently across strategic environments.

If the others' mean reaches four m , the unclipped expression would be minus one half m , so T is set to zero. This corner does not imply a negative score or an out-of-range choice. A participant can choose zero and receive the maximum against that given average. Unique equilibrium is preserved because clipping does not amplify distances. Not every extreme choice indicates confusion; some are best responses to extreme profiles.

Fehr and Tyran's 2008 work motivates contrasting complementarity and substitution when examining the transmission of limited responses. This application uses a different function and does not transfer the article's numerical results. Compare the direction of price deviations with the

direction of forecasts. If students expect high other prices and also choose high under substitutes, check their understanding of the coefficient's sign. That issue differs from nominal conversion, although both difficulties may coexist.

4.7 Unit converter and automatic companies

The converter accepts any nonnegative amount N and displays the corresponding ECU using the current c . It does not know other companies' choices, calculate a recommended price, or alter the submitted choice. It is supplied in both nominal and real displays to distinguish access to assistance from the main presentation. After a change to fifty, converting fifty N gives one hundred ECU; after a change to one hundred fifty, it gives approximately 33.333. Availability does not guarantee that a participant uses it.

The automatic control retains a equal to one half. The three companies share a price solving their simultaneous best responses to the human price and the other two automatic prices. The disclosed formula is m times three times one minus a , plus a times p divided by m , all divided by three minus two a . If the human chooses q equal to one, the automatic companies do likewise. If the human chooses q equal to two, their relative prices equal 1.25.

The human's optimal choice anticipating that rule remains q equal to one. However, distance from realized T is a conditional description: changing the human price would also change the automatic average. Do not interpret that distance as unilateral optimization with stationary computers. The control supports discussion of social uncertainty, while the converter addresses calculation difficulty; neither is a literal replication of a published treatment.

Unit conversion

Amount N to convert

50

Equivalent ECU: 100

This tool only converts units. It does not use actual prices of other companies or recommend a choice.

► How the activity works

Figure 4.1: Converter that does not recommend a choice.

Your ECU score is calculated using these rules:

$$\begin{aligned} T &= \max(0, \min(4m, (1 - a)m + a \times \text{Average of the other companies})) \\ \text{ECU} &= 100.0 \times \exp(-((p - T) / (0,5m))^2) \\ N &= c \times \text{ECU}; \text{ECU} = N / c \end{aligned}$$

T is restricted to the interval from 0 to 4m. The average includes only the other three companies. The maximum score is reached when your price equals T.

$$p_{\text{automatic}} = m \times (3(1 - a) + a \times p/m) / (3 - 2a)$$

The table and result display your ECU score directly. $N = c \times \text{ECU}$ expresses the same amount in units of account.

Figure 4.2: Transparent rule for automatic companies.

Private report and interpretation of results

5.1 Progress and controlled revelation

The report opens with real participants, completed episodes, pending episodes, and observed decisions. In human sessions, an episode is one group of four in one period. In automatic controls, it is one person with three programmed companies in one period. Eight humans over ten periods generate twenty episodes and eighty decisions. Eight people in automatic controls generate eighty episodes and the same eighty decisions. The denominator differs because the interaction unit differs, even when observation counts match.

Aggregate results are hidden whenever the report opens. The reveal button becomes available only when all active episodes are completed. The instructor can reveal and hide results; reloading restores the hidden state. While episodes remain pending, the page refreshes every ten seconds to support monitoring. Authentication protects the entire report. The hide button controls projection and does not replace authentication.

A single-interaction session counts its first period only, even if the administrator opens the tenth technical-period report view. The application aggregates active periods explicitly rather than interpreting nine unused periods as missing choices. Before projection, check the expected total and explain what an episode means. Do not compare human and automatic episode counts as if they measured the same number of social groups. This denominator check is also the first step when a report appears to contain fewer observations than expected.

5.2 Relative-price distribution and evolution

The histogram groups q between zero and four into eight bins of width one half. Each label displays the interval and observation count. The final bin includes four; the others include their lower bound and exclude their upper bound. Heights are scaled so that the most frequent bin uses the available maximum. They are therefore not percentages, even though bar styling uses proportional heights. Compare counts and denominators rather than only the visual size of the bars.

The time figure displays mean q by period on a vertical scale from zero to four. A horizontal line at one marks the benchmark, and a vertical line marks period six when m changes. A halving of nominal price can appear as a stable relative-price line if q remains unchanged. This is more suitable for comparing adjustment across scales than an unnormalized nominal-price line.

The histogram pools completed active periods and describes the overall session distribution. It does not replace separate pre-change and post-change distributions. The period table identifies when

Instructor report: price adjustment

Reference: nominal, negative change

Real participants

4

Completed episodes

0/1

Pending episodes

1

Observed decisions

0

Each episode contains four people in one period. Rematching changes group membership.

Results stay hidden until all active episodes are completed. This page refreshes every ten seconds.

Reveal aggregate results

Figure 5.1: Report without data: revelation remains disabled.

Instructor report: price adjustment

Nominal, positive change

Real participants

4

Completed episodes

6/10

Pending episodes

4

Observed decisions

24

Each episode contains four people in one period. Rematching changes group membership.

Results stay hidden until all active episodes are completed. This page refreshes every ten seconds.

Reveal aggregate results

Figure 5.2: Partial progress and hidden aggregate results.

deviations accumulate, while exported data support later phase-specific analysis. A mean near one can conceal high and low choices that cancel. Check dispersion and mean absolute benchmark distance before claiming convergence. The graph should prompt questions about the distribution rather than merely reward a visually flat line.



Figure 5.3: Report indicators with defined denominators.

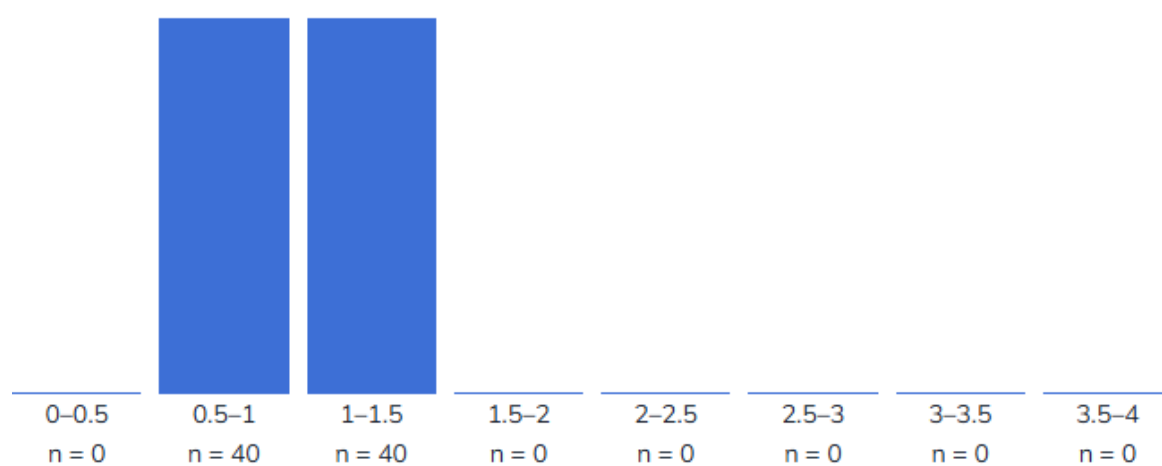
5.3 Three distances and forecast error

Benchmark distance is the absolute value of q minus one. Realized-response distance is the absolute value of p minus T , divided by m , using the actual average of the other companies. Response-to-estimate distance uses the same calculation but replaces the realized average with the reported forecast. Forecast error is the absolute difference between the forecast and actual average, again divided by m . These measures are comparable across scales because they use relative units.

With m equal to fifty, own price seventy-five, forecast one hundred, and realized average eighty, benchmark distance is one half. The response to the forecast is seventy-five, giving zero distance. The realized response is sixty-five, giving a distance of two tenths. Forecast error is four tenths. This example describes a choice consistent with an expectation that was not confirmed, which differs from choosing far from the response implied by one's own forecast.

Report cards display means of these distances over completed choices. A card cannot reconstruct the whole distribution or identify individual decision processes. Under independence, the response does not depend on the forecast, so the two response distances coincide. With automatic companies, remember that realized response is conditional on the generated average. Optimization that anticipates the automatic rule must be assessed using that complete function. Have students explain why each distance answers a different question before showing numerical comparisons.

Relative-price distribution



Evolution by period

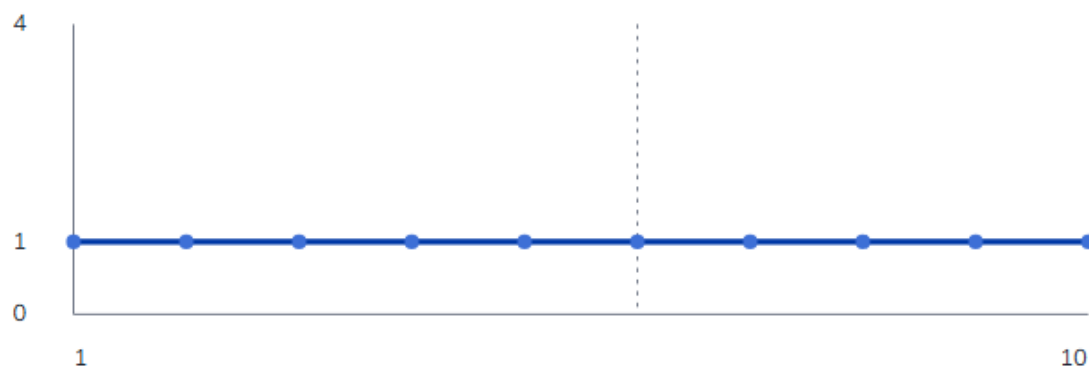


Figure 5.4: Histogram and relative-price evolution after revelation.

5.4 Descriptive anchoring and confirmed convergence

Previous nominal-price proximity counts post-change choices within five percent of the initial scale. In the presets, that interval runs from ninety-five to one hundred five. Its denominator contains only choices in periods six through ten from completed episodes. The first five periods are excluded because one hundred is also their benchmark. This prevents high pre-change frequency from being mistaken for post-change persistence.

Convergence is defined using a group's mean absolute distance from q equal to one, rather than the distance of its mean. The distance must be no greater than one tenth for two consecutive post-change periods. If periods six and seven meet the criterion, entry is counted as one period since the change. If only period ten meets it, there is no within-horizon confirmation. Paths without a confirmed pair are censored; they are neither discarded nor automatically assigned entry at five.

The report shows the number of complete qualifying paths and mean entry among those that qualify. That conditional mean can be small even when many paths fail to converge, so read it with its numerator and denominator. The measure is inapplicable under random rematching because a period-specific group identifier does not track the same people. It is also inapplicable without a scale change. This definition makes the criterion observable and reproducible rather than relying on an impression that the plotted line looks settled.

5.5 Payments, losses, and limits of welfare interpretation

Mean ECU score indicates how far outcomes lie below the default maximum of one hundred. For one choice, one hundred minus payment is a score loss relative to that maximum, not a loss of national output. The game does not model consumers, production costs, quantities sold, or surplus. The sum of scores cannot be interpreted as GDP, and changes in scores do not measure inflation.

Losses depend on distance from T rather than benchmark distance alone. An out-of-equilibrium profile may give the maximum to a company responding exactly to the others' average while those other companies earn less. Even a small relative distance can have a different payoff effect if the function's width changes. Preserve the specification when comparing scores, and do not apply the same efficiency label to conditions with different payoff functions.

The final total adds each period's rounded score. Under the presets, a participant can earn at most one thousand ECU over ten periods, but there is no extra reward simply for remaining connected until completion. If the instructor converts ECU into money or grades, the rule should be announced and common across conditions. The application records experimental points. It does not process monetary transfers, bank accounts, or personal payment information. This limitation should be clear before students infer that a large nominal total represents a payment commitment by the laboratory.

5.6 Statistical units and careful comparisons

Prices within a human group are not independent observations: each company affects the average determining other companies' payments. Ten periods from one person are also not ten new participants. A session with eight people contains two fixed groups, not eighty independent units. Causal comparison requires assignment and inference that respect those dependencies. The report describes a classroom session; it does not automatically perform experimental inference with appropriate standard errors.

Rematching also creates dependence through repeat individuals and encounters. Do not draw a history of group one as if its membership remained stable. To study personal paths, use anonymous participant codes in the export and define the unit explicitly. To study treatment differences, retain session, condition, period, and assignment rules rather than pooling every row into a statistical test that ignores clustering.

In automatic-company controls, participants do not share decisions or wait for one another. They may nevertheless share instructions, a classroom, or an instructor intervention, so operational independence does not eliminate every common influence. Responsible interpretation can describe patterns consistent with a hypothesis and identify missing controls. Avoid claiming that one class conclusively established a psychological mechanism or that a statistically inconclusive comparison proves the absence of an effect. Students should learn to distinguish the number of rows from the number of independently assigned experimental units.

5.7 Feedback script and connection to macroeconomics

Begin by asking students what changed between periods five and six. Next ask them to convert two nominal amounts into ECU and explain why nominal amounts cannot simply be added. Once units are clear, display the relative-price distribution. Ask whether a mean near one describes every participant and what dispersion adds. Then introduce forecasts and best responses to discuss which expectations could explain persistent prices.

Use the macroeconomic connection as a bounded analogy. Companies expecting persistent nominal decisions by others may adjust differently when their responses are complementary. This idea helps explain aggregate transmission, but the classroom does not reproduce wage contracts, institutional rigidity, monetary policy, or an entire economy. The exogenous scale change is a design device rather than an estimate of any country's inflation.

End by asking for an additional control and an observable prediction. If conversion difficulty is the main issue, what should change with the converter, and what should remain unchanged? If expectations about people matter, what does the automatic control contribute? Also request an explanation of an outcome opposite to the initial expectation. This discipline turns the exercise into practice in economic and experimental reasoning rather than a search for examples confirming an instructor-supplied label. Invite students to state what evidence would make them revise their explanation.

Feedback script

Which amount was converted? What did you expect the other companies to do? Did your price respond to that expectation? Separate these questions before assigning a psychological explanation.

Exercises, data, and continued teaching use

6.1 Class sequence and allocation of time

For a sixty-minute class, reserve ten minutes for access and instructions, five for comprehension, twenty for ten periods, and twenty-five for discussion and a written exercise. Adjust these allocations to attendance and mathematical preparation. They are not a duration guarantee: slow connections or groups needing assistance may increase waiting. A single interaction shortens the decision phase and leaves more time for deriving the function.

During the activity, address operational questions without projecting outcomes. If a student asks which price maximizes payment, refer to the rules and example table instead of solving the choice while conditions are being compared. When everyone finishes, open the report and check denominators before revelation. Explain observations first and theory afterward; announcing the behavioral prediction before choices can change the exercise.

At the end, ask each team for a worked calculation and an interpretation that states its limits. One task can identify a profile with positive benchmark distance but zero realized-response distance. Another can compare predictions under complementarity and substitution. Assess reasoning and conversion clarity, not whether a participant earned more points than others. The activity teaches the distinction between a choice, its information, and its outcome, and assessment should preserve that distinction. Allow students to revise an initial explanation after consulting the report and calculations.

6.2 Conversion and scoring exercise

Set the scale at fifty and the other prices at forty, sixty, and eighty. Their mean is sixty. With one-half interaction, T is fifty-five. A company choosing sixty-five lies ten above T . Width is twenty-five, scaled distance is four tenths, and its square is 0.16. Payment is approximately 85.21 ECU. The nominal display shows approximately 42.607 units N ; dividing by one half recovers the payment before final rounding.

Repeat with scale one hundred fifty and every nominal quantity in the profile multiplied by three. Other prices become one hundred twenty, one hundred eighty, and two hundred forty; their mean is one hundred eighty. T is one hundred sixty-five and the focal price is one hundred ninety-five. The distance of thirty divided by seventy-five is again four tenths. Real payment is unchanged, while nominal payment is approximately 127.822 units N with c equal to one and a half.

The solution demonstrates invariance when all relevant nominal quantities change proportionally.

If only m changes while prices remain fixed, the relative profile changes and payment need not remain equal. That distinction is the exercise's central point. Ask students to identify which numbers were scaled and which amounts remained real, preventing the equivalence from becoming a memorized instruction to divide by two. Have them verify both profiles directly from the function rather than relying on the displayed examples.

6.3 Expectations and substitution exercise

Take m equal to fifty and a forecast of one hundred for the others' mean. With one-half interaction, the response to the forecast is seventy-five. With eight-tenths interaction, it is ninety. At zero, it is fifty. With minus one half, it is twenty-five. All four responses come from the same forecast but represent different mechanisms. Ask students to order the responses and explain the slope's sign without attributing the differences to participant types.

Now suppose the realized average was eighty. Realized reference prices are sixty-five, seventy-four, fifty, and thirty-five, respectively. If each company chose the response to its forecast, response-to-estimate distance is zero in all four conditions, while distance from realized T differs. Forecast error is four tenths in every case. The example separates a common information error from its transmission through different coefficients.

Extend the exercise by considering an average of two hundred under substitutes. The unclipped T would be minus twenty-five, and the program clips it to zero. The permitted best response is zero. Ask why clipping matters when conditions share the same relative interval. Finally, request a forecast that makes T equal to the benchmark in all four conditions and explain why it does so. The answer is a forecast equal to m ; independence additionally makes every forecast yield the same T .

6.4 Export and data dictionary

The custom export contains one row per real person and active period. It records anonymous session and participant codes, language, edition, treatment, matching, period-specific group, completion status, and automatic-control status. It also stores scale, coefficient, width, maximum, display, price, forecast, actual others' mean, T , relative price, conversion, N , ECU, and the report's four distances. It creates neither automatic-company rows nor rows for inactive technical periods.

A calculated field remains empty until its episode has been settled. Do not replace missing values with zero: zero may be a valid choice and does not mean that no response occurred. Completion status separates data eligible for payment and aggregates from isolated choices in incomplete human groups. Preserve those records if an incident needs documentation, but explain exclusions before comparing conditions.

Participant codes support longitudinal analysis without names. Group codes identify stable membership only in fixed designs. Under rematching, use group and period together and refer to the formation rule. Keep conditions' sessions separate and preserve their parameters. Analyses of nominal amounts must retain c so ECU can be reconstructed. A spreadsheet containing only price and N loses the information needed to distinguish scale changes, strategic responses, and real scoring. Store the export with a brief protocol note describing assignment, any interventions, and the meaning of blank fields.

6.5 Common problems and instructor responses

If a room lists options from another family, the instance is not properly isolated and should not be used as the final product. If a basic room selects an extension, check the route and language before creating a session. If the form rejects attendance, verify whether the human condition requires multiples of four. Do not switch to automatic companies solely to bypass rejection without explaining that the interaction and comparison question change.

An extended wait usually means that someone in the group has not submitted a choice. Use Monitor to locate the stage without projecting names or forcing a response. Check inputs and connectivity. Reloading a decision after submission does not create another choice, and a duplicate tab may confuse progress. A participant already at the final screen does not need to find another button: participation is complete.

If the report contains data but cannot reveal results, compare completed with expected episodes. One incomplete group in any active period keeps revelation disabled. If a metric is inapplicable, check whether the scale is constant or rematching is being used. Distinguish planned exclusions from errors. An unexpected outcome can be valid behavior; preserve the rules and data before trying to correct a choice that differs from a prediction. The instructor's first response should identify the operational state rather than reinterpret or overwrite a participant's decision.

For the instructor

Resolve incidents without fabricating choices. An incomplete episode remains excluded from aggregates and keeps complete revelation disabled.

6.6 Primary evidence and interpretation debate

Fehr and Tyran (2001) examine nominal and real representation in experimental price setting. Fehr and Tyran (2005) explain how strategic environments can transmit individual responses into aggregate outcomes. Fehr and Tyran (2008) compare complementarity and substitution. These sources motivate questions and controls rather than mandatory classroom outcomes. Choices in this application come from its own function and should not be presented as reproductions of their data.

Petersen and Winn (2014) challenge the interpretation and emphasize cognitive difficulty and response shape. Fehr and Tyran (2014) defend their explanation and the role of expectations. The debate requires considering alternatives and separating representation, calculation, and coordination. The converter, independence, and automatic controls help discuss those alternatives. They do not settle the controversy or literally replicate its protocols.

When reading the papers with students, identify the experimental unit, available information, payoff function, and central comparison. Ask what changes when a deflator depends on others' prices rather than an exogenous scale. Then request one claim that can transfer conceptually and another that needs new data. This reading practice teaches responsible use of evidence without extrapolating parameters or magnitudes. Retain complete references and consult official or author versions; a brief catalog description does not replace the original protocol. Separate the papers' findings from the classroom observations throughout the discussion.

6.7 Updating, publication, and future use

The package includes code, configurations, bilingual metadata, real screenshots, tests, and editable guides. Its local instance uses an exclusive database and port so that Demo, Rooms, Sessions, and Data contain only this family. After changing an application file, restart only that process and preserve its database. Saving code does not make the running server reload it. A schema change affecting existing sessions requires checking its consequences before recreating data.

Recording the package in Git does not publish the subdomain. Uploading to GitHub also does not establish that the institutional server has been updated. The panel reads the card from metadata and guides; editing generated catalog HTML is unnecessary. Publication and public routes require the laboratory procedure. Before a real class, check the domain response, family isolation, four rooms, and participant access from another device.

After the first teaching use, record actual duration, frequent comprehension problems, and discussion questions. Those notes can improve the protocol without turning personal results into public material. If a rule or text changes, update both languages, retest affected branches, and recapture the corresponding screens. Before producing the next family, check the catalog again and seek a distinct mechanism. Expanding macroeconomic topic coverage does not justify duplicating an activity that already teaches the same decision. Preserve the distinction between a validated local package and a publicly deployed game in every later handoff.

Bibliography

- Fehr, E., and Tyran, J.-R. (2001). Does Money Illusion Matter? *American Economic Review*, 91(5), 1239–1262. <https://doi.org/10.1257/aer.91.5.1239>.
- Fehr, E., and Tyran, J.-R. (2005). Individual Irrationality and Aggregate Outcomes. *Journal of Economic Perspectives*, 19(4), 43–66. <https://doi.org/10.1257/089533005775196651>.
- Fehr, E., and Tyran, J.-R. (2008). Limited Rationality and Strategic Interaction: The Impact of the Strategic Environment on Nominal Inertia. *Econometrica*, 76(2), 353–394. <https://doi.org/10.1111/j.1468-0262.2008.00836.x>.
- Petersen, L., and Winn, A. (2014). Does Money Illusion Matter? Comment. *American Economic Review*, 104(3), 1047–1062. <https://doi.org/10.1257/aer.104.3.1047>.
- Fehr, E., and Tyran, J.-R. (2014). Does Money Illusion Matter? Reply. *American Economic Review*, 104(3), 1063–1071. <https://doi.org/10.1257/aer.104.3.1063>.