



Instructor's Guide to the Emergence of Money

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

Behavioral and Experimental Economics Research Lab
Department of Economics



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

How to use this guide

This guide supports the preparation, implementation, and classroom discussion of the family of emergence-of-money 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

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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.

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Preparation and teaching route

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.

o	Emergencia del
	dinero y medios
o	Emergencia del dinero y medios de intercambio / Emergence of Money and Media of Exchange — BEER Lab Seleccione una variante de este juego. Select a version of this game.
os: pareja fija	
os: parejas reasignadas	
ostos 0, 1, 2	
es	
tidos	
de bajo costo	
de la contraparte visibles	
encuentros	
nuación aleatoria	
onte fijo	
Enuación aleatoria	
antes, continuación aleatoria	
osto, continuación aleatoria	
iter	
ers: fixed pair	
ers: rematched pairs	
osts 0, 1, 2	
sts	
st goods	
terpart preferences	
ng network	
lom continuation	
d horizon	
lom continuation	
okens, random continuation	
is, random continuation	

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

Rooms

Current rooms:

[ES] Emergencia del dinero: básica
[EN] Emergence of money: basic
[ES] Emergencia del dinero: extendida
[EN] Emergence of money: extended

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

Room: [EN] Emergence of money: basic

Create a new session

Session Config

[EN] One encounter

Number of participants

Complete groups of 12 participants. Use a multiple of 12; minimum 12.

Create

[Configure session](#) 

App sequence

emergence_money_game (24 rounds)

Emergence of money: bilingual interactive classroom adaptation of search-theoretic exchange.

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	Explain how objects not desired for consumption can facilitate later exchange.
Experimental unit	Independent twelve-person economy: four people in each of three types.
Basic edition	One encounter, ten fixed-pair encounters, or ten randomly rematched encounters.
Extended edition	Eleven conditions per language including the reference: costs, information, networks, horizon, and tokens.
Decision	Accept or reject a bilateral exchange of one unit.
Payoff	Initial 100 ECU + 10 per consumption - realized costs. Complete episode, no residual object value.
Suggested duration	50–70 minutes for ten encounters and discussion; planning estimate without timing pilots.
Participants	Multiples of twelve. Three balanced types in each economy.
Topics	double coincidence of wants; media of exchange; storage costs; bilateral search; monetary circulation; fiat money.
JEL	A22; C92; D83; E40.
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1.3 The question addressed by the activity

The activity asks how an object that a person does not want to consume can facilitate exchange. Its mechanism is a sequence of bilateral encounters with persistent inventories. Accepting an object today may enable later consumption, but it may also reduce a current storage cost. Separating these motives is the main teaching objective. Each student produces one good and consumes another, so meeting someone who holds the desired good does not ensure that the person wants the object offered in return.

The family enters the macroeconomics curriculum through the functions of money and exchange frictions. The ECU balance scores decisions but is never transferred between participants. Goods identified by numbers, and tokens in some conditions, are the objects exchanged. This distinction matters: ECU appearing on a screen does not create an operational currency in the experimental market. The score's unit of account and the medium used for exchange are different elements.

The product is an interactive game. The independent unit is a twelve-person economy, although each encounter involves two counterparts. Inventories connect participants through later exchanges, so a pair is not an independent unit across periods. Demographic questions are absent. The purpose of a class is to reconstruct chains and incentives whether broad acceptance develops or exchange remains limited. Students should be able to identify what moved, why consent was needed, and how a later consumption opportunity could justify accepting an unwanted object.

1.4 Choosing a basic option

The basic edition provides three options per language. One encounter explains consent and coincidence of wants without presenting a learning process. Ten encounters with a fixed pair expose the limitation of repeatedly meeting the same person. Ten randomly rematched encounters let an object circulate among different types within the economy. Production, consumption, storage, and scoring remain the same. A teaching comparison changes the meeting structure rather than the payoff rule.

Random rematching is a useful starting point for a full first class. The single encounter works as an opening demonstration or prediction exercise. It cannot establish that a good gained general acceptance: each person faces only one opportunity. The fixed option is a deliberately restrictive comparison rather than the canonical random-search environment. Some pairs can generate an initial consumption and then become blocked by incompatible inventories. That outcome follows from the meeting structure and deserves explanation.

Ten periods are not ten independent games. An object retained after rejection remains available next period. Consumption is followed by replacement with one's production good. Starting a new session removes that economic history and creates a new episode; progressing to another page preserves it. Choose the option by stating the teaching question first: consent in one encounter, restrictions of a fixed relationship, or circulation through broader contacts. That question determines which report and exercise will be useful afterward.

1.5 Participants, types, and independent economies

Each economy needs twelve people: four type A, four type B, and four type C. A produces Good 1 and consumes Good 2; B produces Good 2 and consumes Good 3; C produces Good 3 and consumes Good 1. Assignments remain fixed. The system accepts multiples of twelve and creates separate economies; counterparts are never drawn from another economy. A class with twenty-four participants has two independent economic units, not one twenty-four-person meeting network.

Before opening a session, verify how many attendees can actually finish. An incomplete economy cannot settle its exchanges. All twelve must reach each synchronization step, although an individual decision concerns one counterpart. Synchronization ensures that next-period inventories come from a fully settled period. An instructor should not replace an absent person with an invented acceptance or turn a waiting state into a fabricated outcome.

If attendance is not a multiple of twelve, allocate observers to a separate prediction and discussion activity, or prepare a complete participant group. Changing group size requires redesigning type

balance and examining assumptions. Observers receive no fictitious links and are not counted as completed choices. Explain that reports are aggregate, and do not project individual start links. Two economies may reach different outcomes with common parameters because decisions and realized encounters differ. Such variation is an object for explanation rather than an implementation failure.

Checkpoint

Verify twelve people per economy, language, condition, and duration rule before distributing links.

1.6 Access through the portal and catalog

Institutional navigation begins at beer-lab.org and continues to the teaching.beer-lab.org catalog. Look for teaching resources and the Emergence of Money and Media of Exchange family once its card has been deployed. This delivery prepares metadata and routes; having a guide does not establish that the public domain already works. Before teaching outside this computer, check the public card and access with the person responsible for deployment.

Instructor access uses Demo and the authenticated administrator. There the instructor selects configuration, language, edition, and participant count. Rooms contains four entry rooms: Spanish basic, English basic, Spanish extended, and English extended. Participants enter through the assigned room or current session links. Demo is not the page distributed for student decisions; it belongs to the preparation workflow.

The local preview uses an isolated family server. Its sessions and data are separate from other games in the repository. Localhost works only on this computer; copying the link to a different machine does not connect that machine to this instance. A remotely accessible class needs the deployed domain. Preserve this distinction in written directions. Screenshots in the guide show synthetic test sessions, not identifiable students or research outcomes. Before distributing links, verify that the opening screen belongs to the selected family and language. This small check prevents an entire class from beginning the wrong activity.

1.6.1 Proposed canonical routes

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

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

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

https://emergenceofmoney.beer-lab.org/room/emergencia_dinero_es

https://emergenceofmoney.beer-lab.org/room/emergence_money_en

https://emergenceofmoney.beer-lab.org/room/emergencia_dinero_extendida

https://emergenceofmoney.beer-lab.org/room/emergence_money_extended

Verified locally: <http://localhost:8085/demo>.

1.7 Rooms and condition selection

Each room displays only its configurations. The two basic rooms offer three options each; the extended rooms offer eleven conditions including the reference. The family has twenty-eight configurations: six basic and twenty-two extended. Language changes the complete interface without changing economic parameters. A room name is the literal prefix of its configurations, allowing filtering without a separate list of names.

When selecting a condition, read its description and check whether the horizon is fixed or randomly continued. Token conditions do not always share the storage costs of the basic reference. A comparison between tokens and goods under random continuation changes an institution: examine costs, initial objects, and horizon before interpreting it as a single-parameter treatment. Comparisons of token abundance or token cost use conditions that preserve the other institutional rules.

Every option requires twelve people per economy. A basic room should initially select a basic configuration in the correct language. If another family's names appear, stop preparation and examine the instance: isolation is an operational requirement. Record the chosen condition before decisions begin. The descriptive treatment label visible to the instructor does not appear as a hypothesis in the participant interface. This separation explains incentives without deliberately directing the class toward a monetary convention. A useful preparation record contains the condition name, language, participant count, horizon rule, and the main comparison planned for discussion.

1.8 Local preview and session continuity

The local family server uses port 8085. Open the instance identified in this guide and verify that Demo and Rooms load. The preview database belongs exclusively to this family. Restarting the process to load a correction preserves sessions; refreshing a template or text does not require deleting the database. Bots use a different database, so technical validation does not change a prepared demonstration session.

Individual links belong to a particular session. A link from an older database may report that the participant no longer exists; creating fictitious people does not repair it. Prepare a new session and distribute its current links. If someone accidentally closes a tab while the session remains available, reopen their existing link. Avoid loading two different participant links at the same desk and losing the operational assignment. The aggregate report does not require showing that assignment.

Before offering a preview, verify that the server remains active and all four rooms contain the correct option counts. Preserve other active lab families. If a schema change makes an old database incompatible, preserve its files and explain which sessions would be affected before recreating it. For a class, a useful preventive check uses twelve synthetic links: cover all three types, a mutually accepted exchange, a rejection, and explicit completion. This checks preparation as well as the economic mechanism. It also reveals whether instructions are legible on the devices actually used.

1.9 Class plan and initial prediction

A ten-encounter class can be planned for 50 to 70 minutes including discussion. This is a preparation estimate, not a measured pilot duration. Allow ten minutes for access, reading, and comprehension; twenty to thirty for encounters; five to describe the report; and fifteen to twenty for reconstructing exchanges and closing. Random continuation can end quickly or approach the cap, so prepare an analysis activity that works with both short and long trajectories.

Before starting, request a written prediction without announcing which object should become money. Ask what difficulty students expect when trying to obtain their consumption good, or when they would accept an object they do not want to consume. Collect answers outside the decision screen so that classroom assessment remains separate from incentivized experimental records. The basic edition does not elicit quantitative beliefs. Inferring beliefs afterward from actions is interpretation rather than observation.

At completion, describe exchanges, consumptions, costs, and indirect acceptance opportunities first. Then reconstruct a chain and compare it with the initial predictions. Introduce media of exchange and double coincidence of wants after that reconstruction. Assessment should reward explanations consistent with the rules rather than the largest balance. Someone with little consumption may have faced unfavorable encounters; someone with a high balance may have succeeded despite poorly informed choices. In a single-encounter class, shorten decision time and expand the worked hypothetical chain.

Participation and accounting

2.1 Opening screen and neutral rules

The opening screen identifies Tecnológico de Monterrey and BEER Lab and introduces an exchange activity. It explains privacy, silence, and navigation rules. It does not announce a hypothesis or tell students which good to accept. Participants confirm that they have read the rules before starting. This confirmation organizes the sequence; it is not research ethics approval and does not replace a consent procedure if a separate research study requires one.

An instructor can give brief operational directions: stay on the assigned pages, decide privately, and raise a hand if a problem occurs. Avoid strategic guidance during decisions. Telling the class that an object is the correct money changes the mechanism the activity examines. If someone asks what to choose, refer them to the exchange and scoring rules rather than recommending an action. The economic instructions already state what they produce, what they consume, and how their balance is calculated.

The interface uses one main heading per screen and clear buttons. A letter identifies type and numbers identify goods; the activity does not rely on a color that may be hard to distinguish when projected. English buttons and messages match the session language. Keep instructor preparation separate from participant decisions. The start-link table is an administrative resource rather than a results screen to project. A correct opening should make the next action clear without suggesting what the experimental outcome ought to be.

2.2 Inventory, production, and consumption

Each person holds at most one unit. In the reference, people start with their production good; token conditions give some people a token instead. Initial inventory never contains one's own consumption good. Instructions distinguish production from consumption: producing adds no ECU directly, while receiving and consuming the desired good earns ten ECU under default parameters.

After consumption, closing inventory is recorded as empty. There is no fee for a nonexistent object. At the start of the next encounter, a new production event is recorded and inventory becomes the person's production good. Replacement occurs before showing the new counterpart. If consumption did not occur, the retained object carries into the next encounter. This timing convention is part of the BEER adaptation and must be preserved when reconstructing balances: do not charge for the replacement good in the preceding encounter.

Production, transfer, and consumption are different events. A transfer moves existing objects between people; consumption removes the desired good and creates points; subsequent production creates a new commodity. Total quantities of each commodity therefore need not remain constant



Encounter 1 / 1

Exchange activity

The Behavioral and Experimental Economics Research Lab at the Economics Department of Tecnológico de Monterrey offers controlled activities to learn about economic decisions. In this activity you hold one object and decide whether to exchange it.

Laboratory rules

- Remain silent. Do not talk or communicate with other participants. Make decisions individually and privately.
- Follow the instructions. Do not refresh, close, or leave the page. If there is a problem, raise your hand or contact staff privately.
- Points are expressed in experimental currency units (ECU). Any conversion to money will be announced before the activity.

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



Figure 2.1: Opening screen and neutral rules.

over the episode. Token quantities do remain constant because tokens are neither consumed nor produced. Data identify initial objects, inventories before and after decisions, and production events. This makes it possible to reconstruct trajectories without attributing replacement to exchange. Ask students to identify these separate events before discussing monetary circulation.

What participants will see

Each person produces one good, consumes another, and holds at most one unit. Tokens cannot be consumed or redeemed.





Encounter 1 / 1

How the activity works

Resources and unit of account

Initial individual endowment: 100 ECU.

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

This session does not convert ECU into real money.

Your type

A

You produce

Good 1

You consume

Good 2

Initial balance

100 ECU

ECU per consumption

10

You may hold only one unit. The three types produce and consume different goods. Your type remains fixed. There are four people of each type in your twelve-person economy.

In each encounter you observe your counterpart's object. Both privately accept or reject. Only two acceptances exchange distinct objects. An object identical to your own does not produce an exchange.

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

A single encounter.

You see the counterpart's object; their type and consumption good are not displayed.

2.3 Consent and identical objects

If you receive your consumption good, you consume it immediately and earn the reward. You begin the next encounter with a new unit of your production good. If you do not consume, you keep the object.

Accepting means offering one's unit in exchange for the counterpart's observed unit. A decision is made without seeing the counterpart's choice. If both accept and objects differ, the objects are exchanged. If either rejects, both retain their inventories. Side payments, price bargaining, and unilateral transfers are absent. These restrictions create the coincidence-of-wants problem: obtaining what one wants requires the other person to be willing to receive the offered object.

Cost per object kept (ECU)

If both hold the same object, two acceptances do not generate an economic transfer. The system records no exchange of distinct objects. Participants may express a choice, but agreement is not

Good 2	12	1
Good 3		2

There will be exactly 1 encounters.

At the end, objects do not convert into points. The final score is the initial balance plus all consumption rewards minus all

Initial individual endowment: 100 ECU.

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

This session does not convert ECU into real money.

Your type

A

You produce

Good 1

You consume

Good 2

Initial balance

100 ECU

ECU per consumption

10

You may hold only one unit. The three types produce and consume different goods. Your type remains fixed. There are four people of each type in your twelve-person economy.

In each encounter you observe your counterpart's object. Both privately accept or reject. Only two acceptances exchange distinct objects. An object identical to your own does not produce an exchange.

A single encounter.

You see the counterpart's object; their type and consumption good are not displayed.

If you receive your consumption good, you consume it immediately and earn the reward. You begin the next encounter with a new unit of your production good. If you do not consume, you keep the object.

At the end of each encounter you pay the cost of the object you keep, once. If you consumed, you hold no object and pay zero in that encounter. Replacement is recorded at the beginning of the next encounter.

Cost per object kept (ECU)

Good 1	0
Good 2	1
Good 3	2

There will be exactly 1 encounters.

At the end, objects do not convert into points. The final score is the initial balance plus all consumption rewards minus all storage costs.

Example: if both people accept distinct objects and you receive your consumption good, you earn the reward and pay zero cost. If you reject, you keep your object and pay its cost.

Continue

Powered by [oTree](#)

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

counted as trade or circulation. This prevents exchange rates from being inflated by movements leaving the allocation unchanged. The decision screen explains the situation before the choice, so the result should not be surprising.

Acceptance is also different from acquisition. The report separates declared decisions from effective acquisitions. Consider someone accepting Good 1 for storage while the counterpart rejects. This reveals a willingness to receive it in that opportunity, but the object has not changed owners. A mediation chain requires realized transfers. The distinction also prevents consumption from being attributed merely to a wish to trade. Explain results by starting with both decisions and then checking object movements. Only after these steps should the class discuss why one object might





Encounter 1 / 1

Your exchange decision

You hold
Good 1

Your counterpart holds
Good 3

You consume
Good 2

In each encounter you observe your counterpart's object. Both privately accept or reject. Only two acceptances exchange distinct objects. An object identical to your own does not produce an exchange.

Your exchange decision

☐ Accept the exchange

☐ Reject the exchange

Continue

Figure 2.4: Inventories and private choice.

2.4 Comprehension checks and waiting

The comprehension check asks about the two rules most likely to generate accounting mistakes: when objects are exchanged and when storage is charged. Correct answers require two acceptances and one closing fee when an object is retained. A wrong answer keeps the person on the page and gives a message in the session language. Correct the rule rather than recommending a strategy. The purpose is to make later actions interpretable as choices under understood incentives.

The first waiting step prepares an encounter after all twelve have completed the previous step.

The second settles decisions once all twelve have chosen. Although consent belongs to a pair, the entire economy synchronizes inventories for the next period. This prevents one participant from entering a new encounter with an object another person has not finished transferring. Waiting screens reveal neither counterpart choices nor provisional outcomes.

If an economy stops progressing, check pending links privately. Do not publicly instruct a particular person to accept so others can move forward: rejection is valid too. Repeated page refreshing does not accelerate settlement. Delay may reflect reading, connectivity, or departure. Collective discussion should wait for completion. The report displays pending periods and disables revelation. An incomplete period is not converted into six zero-valued trades or twelve observed decisions. Treating missing actions as rejection would change the description of behavior and its denominators.



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



Encounter 1 / 1

Check the rules

When are two distinct objects exchanged?

- ☐ When both people accept
- ☒ When only one accepts

Your answer: When only one accepts. The correct answer is When both people accept. Review the rules: both people must accept, and the cost is charged once at the end.

When is the cost of holding an object charged?

- ☒ Once at the end of the encounter, if you keep an object
- ☐ Before and after the exchange

Continue

Powered by [oTree](#)

Figure 2.5: Current comprehension check with an incorrect answer, its specific explanation, and retained responses.



Wait for your economy

All twelve people must complete this step to record exchanges and prepare inventories.

Decisions remain private. Do not close or refresh the page.

Figure 2.6: Within-economy synchronization.

2.5 Worked example of an indirect chain

Suppose a type B person holds Good 2 and wants Good 3, while a type C person holds Good 3 and wants Good 1. Both accept. B receives and consumes Good 3, earning ten ECU and ending with no object and zero fee. C receives Good 2, which C cannot consume. Under reference costs, C pays one ECU and retains Good 2. Starting from balances of one hundred, B ends at one hundred ten and C at ninety-nine. The exchange is direct for B and indirect for C.

Next encounter, B produces a new unit of Good 2 while C keeps the acquired Good 2. If C meets type A holding Good 1, A wants Good 2 and C wants Good 1. Two acceptances let both consume. C earns ten ECU, pays no fee, and moves from ninety-nine to one hundred nine. The first encounter's one-ECU cost belonged to a chain enabling later consumption. It was not a purchase paid in ECU: points never moved between counterparts.

The chain requires favorable encounters and three types, so initial acceptance does not guarantee it. If C never meets A, storage costs may continue. Ask students to distinguish their decision from later meeting opportunities. Then change only the cost of holding Good 2: a higher fee lowers the chain's net benefit. The example establishes a possibility and explains incentives, rather than proving a unique equilibrium or predicting a success frequency.

2.6 Balance and complete-episode payoff

The default score is one hundred ECU plus ten per consumption minus realized storage costs. Initial endowment is added once. Later periods add only the encounter's change. Summing changes therefore omits the initial balance unless it is added separately; summing balances across screens is also wrong because it counts the same wealth repeatedly. The closing trajectory allows these identities to be checked.

Consider four encounters with consumption in the second and fourth. In the first, the person retains Good 3 and pays two. In the second they consume and pay zero. In the third they retain Good 2 and pay one. In the fourth they consume and pay zero. The final balance is one hundred plus twenty minus three, or one hundred seventeen ECU. Changes are minus two, plus ten, minus one, and plus ten. Intermediate balances are ninety-eight, one hundred eight, one hundred seven, and one hundred seventeen. Adding them has no payoff interpretation.

The family rewards the accumulated episode rather than randomly selecting one period for payment. Random-period payment would alter incentives for accepting an object useful only later. Objects and tokens receive no residual value at completion. Reward and endowment parameters are



Encounter 1 / 1

Encounter result

No exchange of distinct objects took place.

You did not consume in this encounter.

Object kept at the end

Good 1

Cost in this encounter

0 ECU

Change in your balance

0 ECU

Cumulative balance

100 ECU

This was the last encounter in your economy.

Continue

Figure 2.7: Exchange, consumption, cost, and balance.

configurable, but must keep the minimum feasible balance nonnegative given costs and horizon. Any monetary conversion is announced before starting and kept separate from course grades.

$$\begin{aligned} z_{it} &\in \{0, 1\}, & h_{it}^{\text{end}} &\in \{\emptyset, 0, 1, 2, 3\}, \\ \Delta_{it} &= 10z_{it} - c(h_{it}^{\text{end}}), & c(\emptyset) &= 0, \\ B_{iT} &= 100 + \sum_{t=1}^{T_i} \Delta_{it}. \end{aligned}$$

2.7 Announced horizon and explicit completion

Fixed options announce one or ten encounters from the beginning. Random continuation has a ninety-percent chance of another encounter after each period, except when the announced cap of twenty-four is reached. Realized duration is reproducibly determined for each economy but is not revealed to participants in advance. Results announce whether another encounter follows. Decisions do not affect the duration draw.

Everyone in an economy shares its ending. Two economies in the same session may finish at different times. The final screen summarizes balances and completed encounters and asks participants to await instructions. It has no button leading to an empty technical page. Finished participants do not enter remaining technical periods or become missing observations in an economy that continues. The report aggregates only active encounters in each economy.

The known cap distinguishes this condition from an unlimited geometric horizon. Its purpose is a classroom comparison of uncertain duration with transparent operational limits. Near the cap, termination becomes certain and may change the value of accepting an object for future use. Discuss that incentive instead of concealing the limit. A token with neither consumption value nor redemption relies on later exchange to generate benefit; a known ending may reduce its appeal. Outcomes deserve interpretation even when broad circulation fails to develop. Explicit completion makes these terminal incentives visible and gives the instructor a clear point for starting feedback.



Encounter 10 / 10

Activity completed

The activity has ended. Wait for the instructor's directions. Objects kept do not add points to your final balance.

Cumulative balance: **82 ECU**

Your trajectory

Encounter	Consumption	Cost in this encounter	Change in your balance	Cumulative balance
1	No	0	0	100
2	No	2	-2	98
3	No	2	-2	96
4	No	2	-2	94
5	No	2	-2	92
6	No	2	-2	90
7	No	2	-2	88
8	No	2	-2	86
9	No	2	-2	84
10	No	2	-2	82

Figure 2.8: Explicit episode completion.

Theory and predictions

3.1 Double coincidence of wants

A simple coincidence occurs when someone meets a person holding the good they desire. A double coincidence additionally requires the counterpart to want the first person's offered good. Initially, A holds Good 1 and wants Good 2, B holds Good 2 and wants Good 3, and C holds Good 3 and wants Good 1. No initial pair simultaneously satisfies both desires. An A–B encounter gives A access to the desired object, but B cannot consume A's object.

This does not make all exchange impossible. It means that requiring immediate consumption for both parties blocks the beginning. Someone may accept an object to retain and transfer later. Persistent inventory enables that different sequence. Indirect exchange expands possibilities without creating a centralized market or guaranteeing the right future counterpart. In a fixed pair, absence of the third type may prevent completing the chain even if an initial transfer benefits someone.

Kiyotaki and Wright (1989) study media of exchange emerging from specialization and bilateral encounters. BEER takes that mechanism, but classroom parameters, synchronization, and horizon are adaptations. A numerical equilibrium from their article is not presented as an exact prediction of this program. For teaching, distinguish a demonstrable initial-inventory restriction from a prediction about human decisions. The first follows from the type table; the second requires observing strategies, encounters, and dynamics. A useful exercise asks students to identify which extra future meeting would convert a one-sided immediate benefit into a mutually useful chain.

3.2 An intermediate object and its circulation

A medium of exchange is accepted to facilitate another exchange, not necessarily for consumption. This function needs to be examined through linked actions: a person receives an unwanted good, retains it, then gives it to another counterpart for a consumption good. The intermediate role depends on someone else accepting the object. Low physical storage cost helps but does not replace expectations about future opportunities.

The report separates opportunities, acceptances, and acquisitions. For a given object, an eligible opportunity requires the offered object to differ from both current inventory and one's consumption good. Acceptance in that category indicates willingness to receive something without immediate consumption. Acquisition additionally requires counterpart consent. Neither measure alone establishes general acceptance. Examine effective transfers to discuss circulation, and use the export to follow inventories along an individual's trajectory.

The program does not give every produced commodity unit a unique serial identifier. A chain

reconstructed from participant, good, and encounter describes inventories and changes, but cannot distinguish two physically identical units after replacement. Tokens retain a fixed aggregate stock, though individual units also have no serial numbers. The aggregate indicator counts token movements rather than individual genealogies. Explain this limit before proposing velocity or holding-duration measures. Absence of circulation also provides information about frictions and strategies; it does not invalidate the activity. The teaching question concerns how acceptance and later opportunities connect, rather than identifying a predetermined successful currency.

Theoretical foundation

Accepting an unwanted object may save storage fees or enable later exchange. The explanations require different evidence.

3.3 Storage cost and acceptability

Keeping an object creates a fee in every encounter where it is not consumed. A cheap good allows waiting with less loss and may become attractive inventory. Accepting something cheap, however, is not the same as using it as money. A person may replace an expensive good with a cheap one and never exchange again. Reports should accompany acceptance with consumptions and effective movements to distinguish cost saving from successful mediation.

Compare retaining Good 3 at cost two with acquiring Good 1 at cost zero when neither is one's consumption good. Mutual acceptance saves two ECU immediately. If Good 1 is later transferred for consumption, it additionally serves an intermediate function. If it remains motionless until completion, the balance improvement came from lower costs. Both actions can fit incentives but support different explanations. Equal commodity costs remove that current hierarchy, allowing acceptance to be examined without a storage advantage among goods.

A cautious comparative prediction is that changing storage costs changes incentives to retain and accept objects, holding other features constant. The design does not guarantee that the cheapest good always circulates or that a class matches a published frequency. Acceptance also depends on available inventories, counterpart preferences, encounters, and remaining time. Ask for one example where the cheapest good fails to help consumption and another where a more costly good enables a short chain. Liquidity then receives an operational meaning rather than becoming a label attached to any popular object.

3.4 Finite horizon and random continuation

In a known final encounter, there is no later opportunity within the episode. A nonconsumable object may still be attractive for current cost savings but loses the benefit of future exchange. Token rejection at completion and acceptance of a cost-reducing commodity are therefore not contradictory. The terminal rule belongs in the explanation. Terminal acceptance also need not show irrationality: equal costs can create indifference, while unequal costs can create savings.

Under random continuation, the probability of reaching encounter t is q to the power t minus one before the cap. Expected duration with maximum M is the sum of those probabilities, equal to one minus q to the power M , divided by one minus q . With q equal to 0.9 and M equal to twenty-four, this is approximately 9.20 rather than ten. Ten belongs to an uncapped geometric horizon. The planning difference is modest, but identifying the implemented institution requires it.

A common economy-level draw prevents one participant from continuing with inventories of counterparts who have finished. Seeds allow comparable calendars to be repeated; opening the

same configuration does not create a new independent duration draw. Record the rule, cap, seed, and realized ending when analyzing duration. Compare encounter-level rates and show how many economies remain active. A late average drawn from one economy has different composition from the opening average. This matters when interpreting a trend as learning rather than survival of particular trajectories.

$$\mathbb{E}[T] = \sum_{t=1}^M q^{t-1} = \frac{1 - q^M}{1 - q} \approx 9.20 \quad (q = 0.9, M = 24).$$

3.5 Fundamental and speculative strategies

In monetary-search literature, fundamental strategies often connect acceptance to intrinsic advantages such as consumption or storage cost, whereas speculative strategies consider future acceptability. These categories require a model and its parameterization. This adaptation does not automatically classify each person from a single button. The same acceptance may save costs and facilitate a chain, while rejection may reflect expected meetings or the remaining horizon.

For teaching, construct two contrasting choices. First, someone accepts a nonconsumable object cheaper to hold than their own; there is an immediate advantage. Second, someone accepts a more expensive object because it may be easier to exchange later. The latter requires explaining the future benefit that could compensate for the current loss. Acceptance by others is insufficient by itself: inventories, types, and meeting rules determine whom the object could benefit.

The basic edition neither requests nor rewards probabilities of future acceptance. Exports therefore contain actions, not declared beliefs. Explanations can be collected during discussion, but cannot be retrospectively turned into prior decisions. A future belief-elicitation extension would need a specified object, event, timing, and possible incentive, followed by an assessment of whether the question changes behavior. The current product keeps its core focused on inventories and consent. This restriction clarifies what is observed and limits overinterpretation of indirect acceptance. It also gives students practice distinguishing a plausible reason for an action from evidence establishing that reason.

3.6 What experimental evidence contributes

Duffy and Ochs (1999) examine adoption of commodities as media of exchange in a search model. They report a tendency toward fundamental strategies even when speculative strategies could yield higher payoffs. This evidence motivates a question: do people mainly respond to current advantages or to future acceptability? It does not imply that a twelve-person class should reproduce published frequencies or that an adaptation with different costs preserves every equilibrium.

Hazlett (2003) presents a classroom activity using specialization, bilateral meetings, and storage costs. It is a pedagogical precedent for explaining monetary functions through decisions. Duffy and Ochs (2002) examine objects without consumption value and illustrate the relevance of storage and expectations for acceptance. The bibliography provides these references with verified identifiers. Their role is to support mechanisms and questions rather than present BEER's program as a literal replication.

A class offers a controlled learning experience, not a conclusive test of a psychological mechanism or real institution. There may be few independent economies, and realized encounters can matter greatly. Describe internal facts first, then a compatible interpretation, then the additional comparison that would distinguish it from alternatives. If no object becomes broadly accepted,

examine coordination, horizon, and costs. A successful teaching demonstration requires understanding constraints rather than guaranteeing money's emergence. Students can assess whether an interpretation explains both acceptance and failure to circulate, which is more demanding than attaching a monetary label to one frequently held object.

3.7 Identities and the macroeconomic connection

The macroeconomic connection comes from aggregating individual actions under common constraints. Six potential pairs per economy-period generate between zero and six exchanges of distinct objects. Each person consumes at most one unit, so consumption lies between zero and twelve. An exchange may generate zero, one, or two consumptions depending on inventories and types. Exchange rates alone do not determine new production next encounter.

For a completed economy, total final balances equal twelve initial endowments plus the reward times total consumptions minus total storage costs. Object transfers do not create ECU between counterparts; score gains come from consumption and losses from storage. This identity checks exports and explains why more object movement need not mean more consumption. It also shows how avoided costs can improve balances without increasing consumed units.

Do not read the score as GDP, national wealth, or measured welfare outside the activity. It is a reward function within a model. A token is not a bank account, central-bank reserve, or debt promise: it is a transferable object with fixed supply. This family complements rather than duplicates credit, bank-run, monetary-policy, and money-illusion games. Its question is what enables exchange when bilateral consent and specialized wants restrict transactions. That microstructure offers an entry point into monetary functions. A useful final exercise asks students which accounting identity survives a change in meeting structure and which behavioral predictions need to be reconsidered.

Extensions and comparisons

4.1 Reference and each comparison's contract

The extended edition contains eleven conditions per language: one reference and ten alternatives. All retain cyclic production, bilateral consent, one inventory unit, and accumulated scoring. The set examines commodity costs, preference information, meeting networks, duration, and tokens. Its size follows specified questions rather than a target number of treatments. The extended reference has ten randomly rematched encounters and costs zero, one, and two for Goods 1, 2, and 3.

Before comparing, write down what changes and what stays constant. Equal costs, reversed costs, and two cheap candidates share the reference horizon and meeting rule. Visible preferences change information about counterpart consumption. A local network changes possible contacts. Randomly continued goods change duration. Tokens introduce a nonconsumable object and replace certain initial inventories; they are not merely a new name for a commodity. Token abundance and cost are studied within that institution.

Conditions run as separate sessions; one session report does not automatically combine other sessions. When a class includes several economies, assign conditions and record units before analyzing differences. Having everyone play the reference and then tokens mixes treatment with experience and order. That sequence can teach but does not isolate a causal effect. The guide provides questions and measures without guaranteeing a particular difference in a single class. A sound comparison begins with an explicit institutional contract, then uses the appropriate denominator rather than comparing whatever aggregate is largest on the screen.

Condition	Specific rule
Reference	(0,1,2); 10; random
Equal costs	(1,1,1)
Reversed costs	(2,1,0)
Two candidates	(0,0,2)
Visible preferences	Visible counterpart consumption good
Local network	Two alternating neighbors; 10
Randomly continued goods	(0,1,2); $q=0.9$; cap 24
Fixed-horizon tokens	3 tokens; cost 0; goods (1,1,1); 10
Randomly continued tokens	3 tokens; cost 0; goods (1,1,1); $q=0.9$
Abundant tokens	6 tokens; cost 0; goods (1,1,1); $q=0.9$
Costly tokens	3 tokens; cost 1; goods (0,1,2); $q=0.9$

4.2 Equal and reversed costs

Equal costs charge one ECU per retained commodity and encounter. This removes storage advantages among goods, though consumption still avoids the holding fee. Ask whether people accept unwanted objects when none is cheaper. Examine opportunities and effective acquisitions by good; acceptance differences can reflect inventory composition and encounters rather than distinct physical properties. Commodities are not fully equivalent, since different types consume different goods.

Reversed costs charge two for Good 1, one for Good 2, and zero for Good 3. The hierarchy changes without changing consumption preferences. A comparative prediction is that retaining Good 3 becomes less costly. If its acceptance rises, ask whether circulation and consumption also increase. If it merely accumulates, cost saving may explain the pattern. The condition distinguishes a good's numerical identity from its storage incentive.

Search theory and Duffy–Ochs evidence motivate examining these dimensions; the small vectors are BEER classroom calibrations, not published equilibrium rates. Ask students to solve the same inventory decision across conditions: retaining Good 1 versus receiving Good 3 when neither can be consumed. Calculate the current cost in each case and identify information needed to evaluate future use. This exercise separates an observable immediate benefit from a belief that was not elicited. Equal-cost results are particularly useful when explaining why broad willingness to accept still needs effective transfers and later consumption before it can be described as successful mediation.

4.3 Two cheap candidates and conventions

The two-candidate condition assigns zero cost to Goods 1 and 2 and cost two to Good 3. It neither imposes acceptance nor designates a currency. It creates two objects with the same current storage advantage. Ask whether a community coordinates acceptance on one, divides it across both, or maintains type-dependent patterns. Consumption preferences still distinguish opportunities; equal fees do not remove them.

Compare indirect acceptance of Goods 1 and 2 using their respective denominators. A higher rate based on two opportunities is not stronger evidence than another based on twenty. Then examine acquisitions and consumption by type. An apparent convention may reflect a trajectory placing one good in circulation more often. The report describes that fact, and private exports permit inventory reconstruction. No automatic test declares that a monetary convention has been established.

For feedback, propose two communities with identical costs but different circulation. Ask for compatible explanations: initial inventories, early decisions, later meetings, or learning. Then ask what comparison would distinguish them. A common seed controls possible encounters, not inventories that depend on choices. This condition is a pedagogical adaptation of multiple potential media. It illustrates that favorable properties can be shared and that social acceptance adds a dimension beyond physical cost. The instructor should be equally prepared to explain concentration, shared circulation, or failure of either cheap object to move beyond storage.

4.4 Visible counterpart preferences

The reference shows the counterpart's held object but not type or consumption good. Visible preferences add the good that person consumes. Own production, consumption, costs, and calendar

stay the same. The information helps evaluate whether a proposed transfer gives the counterpart direct consumption. It does not reveal their current choice or force acceptance. Knowing incentives does not remove the requirement for consent.

A useful example is seeing Good 3 and learning that the counterpart wants Good 1. Someone holding Good 1 can recognize a direct opportunity for the other person while assessing what receiving Good 3 would provide. If they consume Good 3, there is a double coincidence; otherwise storage and future use matter. Information may improve explanations of acceptance or rejection without guaranteeing more trade. People may reject when they see that the proposal lacks an immediate counterpart benefit.

This is a classroom information comparison within the search mechanism, not a replication of a published treatment with this exact screen. Examine exchange, consumption, and indirect opportunities. Higher consumption can coexist with lower acceptance of unwanted objects if information helps identify direct trade. Do not evaluate the condition through only one measure. Ask students which inference was available before submission and what remained uncertain, including the other's choice and future encounters. This also highlights why more information

a




Encounter 1 / 10

Your exchange decision

You hold

Good 1

Your counterpart holds

Good 3

You consume

Good 2

Your counterpart consumes: Good 1

In each encounter you observe your counterpart's object. Both privately accept or reject. Only two acceptances exchange distinct objects. An object identical to your own does not produce an exchange.

Your exchange decision

☐ Accept the exchange

☐ Reject the exchange

Continue

Figure 4.1: Visible counterpart consumption good.

4.5 The local meeting network

The local network arranges twelve people on a circle and alternates two matchings: each person meets two neighbors. Types remain interleaved A, B, and C. The network stays fixed for ten encounters. Unlike fixed pairs, each person meets two counterparts; unlike random rematching, they cannot meet any of the eleven others. This compares access to contacts rather than communication.

The restriction may create local chains and limit others. An object useful to a distant person must circulate through neighbors to reach that destination. Cost and acceptability then depend on accessible types and inventories. The network need not always reduce consumption: repeated contacts may facilitate local coordination, while restricted contacts may prevent useful meetings. Decisions and trajectories determine the outcome.

The condition is a technically specified BEER adaptation of restricted search; evidence about this exact ring is not attributed to Kiyotaki and Wright. Use the same pair-level and decision-level rates as the reference and examine economy trajectories. Exports record counterpart positions to verify alternating neighbors. Draw three links and locate a good that needs to reach another type. Ask which extra decisions indirect movement requires and why six pairs per period do not imply equivalent contact networks. A ring also helps students see that a participant can face familiar contacts while still depending on decisions beyond those contacts through the inventories they carry.

4.6 Goods and tokens under different horizons

Randomly continued goods retain reference costs and replace ten fixed encounters with ninety-percent continuation and a cap of twenty-four. This examines horizon while retaining commodity institutions. Fixed-horizon tokens introduce three tokens and ten encounters; every commodity costs one ECU and tokens cost zero. Randomly continued tokens retain that endowment and those costs but change duration. The two token conditions isolate the horizon rule within the same institution.

The three initial tokens are balanced across types, one per type, replacing production goods. Tokens cannot be consumed, destroyed, or redeemed. Trading a token for a commodity requires two acceptances and moves it to another person. Receiving a token can lower costs and create future opportunities while leaving the recipient without a consumable commodity for now. Token holdings receive no residual reward. Duffy and Ochs (2002) motivate nonconsumable objects; endowment, small fees, and the announced cap are adaptations.

Explain the comparison using transfers per token-period together with acceptance and consumption. Ask when acquiring a token is attractive and when surrendering one is attractive. A widely retained token that is rarely passed can save storage costs without facilitating many exchanges. A short realized horizon may prevent observation of learning. Do not compare accumulated balances across different durations as if everyone had identical opportunities. Use rates and describe the encounter count in each economy. A duration comparison is meaningful only after stating which objects, costs, and initial allocations it preserves.

Attention

The twenty-four-encounter cap is announced. Random continuation is not a literal infinite-horizon replication and does not guarantee token acceptance.

do not consume, you keep the object.

At the end of each encounter you pay the cost of the object you keep, once. If you consumed, you hold no object and pay zero in that encounter. Replacement is recorded at the beginning of the next encounter.

Cost per object kept (ECU)

Token	0
Good 1	1
Good 2	1
Good 3	1

Your economy contains a fixed number of tokens: 3. Nobody consumes a token. It cannot be destroyed and has no final redemption. Some people start with a token instead of their production good. Acceptance is voluntary.

After each encounter the probability of continuing is 90%. The announced maximum is 24 encounters. The end is announced after each result. At the maximum, the activity necessarily ends.

At the end, objects do not convert into points. The final score is the initial balance plus all consumption rewards minus all storage costs.

Example: if both people accept distinct objects and you receive your consumption good, you earn the reward and pay zero cost. If you reject, you keep your object and pay its cost.

Continue

Figure 4.2: Token and duration rules; real excerpt.

4.7 Token abundance and token cost

Abundant tokens increase stock from three to six in a twelve-person economy: two people of each type start with a token. Random continuation, zero token costs, and one-ECU commodity costs stay the same. Initial composition changes, with fewer commodities and more potential intermediates. This is not an ECU injection or deposit creation. The question concerns how intermediary-object supply changes exchange and consumption opportunities within the institution.

Costly tokens retain three tokens and random continuation but charge one ECU for retaining a token; commodity fees are zero, one, and two. Tokens are no longer strictly cheaper than every commodity, and Good 1 has a storage advantage. Comparing this with standard tokens changes the whole cost structure rather than isolating a token tax. It examines competition between a nonconsumable object and commodities with different properties, so interpretation must record the complete vector.

Examine token acceptance, transfers per token-period, and consumption per decision. Doubling stock doubles the velocity denominator: the same transfer count produces lower velocity without establishing that individuals accept less. A more costly token might circulate because people expect later use, but that reason is not observed as a belief. These extensions draw on supply and storage dimensions studied in token literature without copying its parameters exactly. Prepare explanations for high circulation as well as immobility. The key question is whether movement creates consumption opportunities after accounting for available objects and storage burdens.

Reading the instructor report

5.1 Progress and active periods

The authenticated instructor report belongs to one session. Its opening view shows participants, independent economies, complete economy-periods, pending periods, and decisions in settled periods. An economy-period is one complete encounter for twelve people, not a pair or an individual choice. Two economies with ten fixed encounters produce twenty expected economy-periods and two hundred forty completed decisions.

Under random continuation, each economy contributes its realized duration. If one ends after four encounters and another after seven, the expected denominator is eleven economy-periods. Technical periods up to twenty-four are not counted as opportunities for an economy that has ended. The report explicitly enters every active round to construct aggregates. It therefore works when an administrator opens the final technical round of a single-encounter configuration.

Incomplete periods do not contribute to settled decision aggregates. This preserves interpretations of transfers and fees as realized outcomes rather than combining submitted actions with unfinished object movements. Progress shows pending activity without identities. Final balances require an economy to reach its last active encounter. A partially completed economy can contribute rates from already settled periods but cannot contribute a final balance. Keep these units separate when explaining any numerator: decisions, pairs, economy-periods, or participants with completed episodes. The denominator determines what the displayed rate actually describes.

5.2 Revelation and projection privacy

Aggregates are hidden whenever the report opens or reloads. Reveal remains disabled until every economy completes its active periods. After completion, the instructor chooses when to show results. A second button hides them again. Reloading returns to the hidden state, allowing projection to be prepared without exposing decisions before discussion. These controls operate in the authenticated administrative interface; participant links do not open the report.

Before revealing, confirm that decisions have ended and final screens show completion. During play, avoid announcing which object is accepted most or which type consumes least. Collective information may alter expectations and depart from the assigned information condition. Reports contain no names, student numbers, individual codes, or seat positions. Type letters identify an economic function shared by four people, not a personal identity.

Exports are used privately if an instructor needs to reconstruct a sequence. Anonymous session and participant codes can link rounds, but the file should not be projected as an aggregate report. Analyze an unusual decision through incentives and opportunities rather than publicly attributing

Instructor report: emergence of money

Reference: costs 0, 1, 2

Participants 12	Independent economies 1
Complete economy-periods 0 / 1	Pending economy-periods 1
Decisions in settled periods 0	

Each economy has twelve people and six pairs per encounter. Decisions within an economy are dependent even when pairs change.

Aggregates remain hidden until every active period is complete. Technical periods after an economy ends are excluded.

Reveal aggregates

Figure 5.1: Report without settled data.

Instructor report: emergence of money

Reference: costs 0, 1, 2

Participants 12	Independent economies 1
Complete economy-periods 1 / 10	Pending economy-periods 9
Decisions in settled periods 12	

Each economy has twelve people and six pairs per encounter. Decisions within an economy are dependent even when pairs change.

Aggregates remain hidden until every active period is complete. Technical periods after an economy ends are excluded.

Reveal aggregates

Figure 5.2: Partial progress and disabled revelation.

it to someone. If periods remain pending, explain that a complete result does not yet exist and that waiting preserves the activity's integrity. Do not use partial graphs to influence unfinished decisions. Revelation is a teaching step after play, not an additional information treatment administered informally during the game.

5.3 Exchange, consumption, and costs

The exchange rate divides transfers of distinct objects by settled pairs. Each pair is counted once although both participants record the transfer. Consumption rate divides consuming participants by decisions in settled periods. Fifty-percent exchange among six pairs means three transfers, not a specified number of consumers. Those transfers can produce different consumption counts depending on inventories and types.

Consider two complete economy-periods: twelve pairs and twenty-four decisions. Seven exchanges and nine consumptions produce rates of 58.3 and 37.5 percent. Their denominators refer to different units. Verify outcomes by adding individual fees and consumption rewards and comparing them with aggregate balance changes. Do not multiply exchange rates by twelve participants to estimate consumption. Nor should rejections be interpreted as waste without examining the offered objects.

Total costs sum storage fees across settled decisions, with zero when inventory is consumed. That zero is an observed outcome; an unsettled period is missing observation. Mean final balance includes only participants in completed economies and shows a dash if none exist. These rules compare institutions and behavior without converting pending activity into outcomes. For feedback, request three statements: how many opportunities occurred, which transfers took place, and which generated consumption or avoided fees. Balances are accounting consequences of those events. This approach helps students explain a high exchange rate with low consumption rather than treating the pattern as an inconsistency.

Feedback script

How many pairs were observed? How many exchanges? How many people consumed? State the denominators before interpreting outcomes.

Exchanges / pairs (%)

6.7

4 / 60

Consumptions / decisions (%)

3.3

4 / 120

Total costs (ECU)

133

Mean final balance (ECU)

92.25

Participants with final balances: 12

Figure 5.3: Rates with separate denominators.

5.4 Indirect acceptance opportunities

The object table reports eligible opportunities, declared acceptances, acceptance rates, and effective acquisitions. Eligibility requires the offered object to differ from one's consumption good and current inventory. This avoids combining direct acquisition for consumption with receiving an object to retain. It also excludes proposals to exchange identical units, which leave the economic allocation unchanged.

Suppose Good 1 appears in ten eligible opportunities, receives seven acceptances, and generates four acquisitions. Acceptance is seventy percent; four acquisitions show that three willing recipients lacked counterpart consent. Acquisition should not be divided by the number of consumers. Each measure answers a different question: willingness, bilateral success, or consumption. People may accept to save costs without planning a chain, so indirect is an operational category of objects and actions rather than an observed intention.

A zero denominator produces a dash rather than zero percent. No opportunities does not mean universal rejection. Compare objects using numerators and denominators together. In a small sample, differences may come from other people's inventories and the encounter calendar. The table is descriptive but establishes neither beliefs nor a monetary convention on its own. To go further, reconstruct acquisitions, later holdings, and transfers associated with consumption in the private export. Keep clear which claim comes directly from the report and which needs additional reconstruction. This discipline prevents a familiar-looking aggregate from becoming a stronger behavioral claim than the data support.

5.5 Types and balance distributions

Consumption by type reports complete decisions, consumption counts, and their rate. Types have different desired and produced goods, so opportunities may differ despite four people of each type. Compare rates as well as totals, especially with economies of different durations. A type letter is neither a personal characteristic nor a psychological explanation. It describes a position in the production-consumption circuit.

The histogram includes final balances from complete episodes. Its intervals show concentration and dispersion rather than only a mean, and every bar includes participant count. Under default parameters and the twenty-four cap, a lower bound follows from endowment minus maximum accumulated fees, while an upper bound follows from endowment plus possible consumption rewards. Balance differences can reflect consumption, storage, and encounters. Dispersion does not identify risk preferences by itself.

To discuss unequal balances, use anonymous trajectories described through types and encounters rather than names. One person may consume more but pay high costs between consumptions; another may consume less and retain a free-to-store good. Then verify the scoring identity. The distribution also explains why course grades should not depend on experimental balances. Teaching assessment concerns understanding rules and evidence, whereas activity rewards reflect decisions under opportunities that differ across people. Ask students to construct two trajectories with the same final balance but different consumption counts, demonstrating that a single balance does not fully describe the economic path.

5.6 Token movement and velocity

In token conditions, the report counts realized exchanges where one of the two units is a token. Each pair is counted once. A pair holding two tokens has no exchange of distinct objects and no token movement. Since nobody consumes or produces tokens, stock stays at three or six per economy according to condition. Retaining a token for a period is not a movement, though it contributes to exposure in the denominator.

Operational velocity is transfers divided by token-periods. The denominator multiplies token stock by complete economy-periods. Three tokens across four settled encounters create twelve token-periods. Six transfers therefore yield 0.5 movements per token per observed encounter. With six tokens across the same four encounters and the same six transfers, velocity is 0.25. The difference can arise without any change in transfer counts, merely because availability changed.

This is not national-accounting monetary velocity based on prices and monetary output. Tokens are not used in multiunit monetary payments and trade has no nominal transaction value. The measure is a transfer frequency for an experimental object. Explain it alongside acceptance, consumption, and fees. A repeatedly passed token that produces no consumption has a different trajectory from one enabling useful chains. Exports can examine later decisions but contain neither declared beliefs nor unique physical identifiers for each token. Naming the operational denominator prevents a familiar macroeconomic term from carrying assumptions that the activity does not implement.

Acceptance of distinct objects for later use

Eligible: the offered object differs from the object held and from one's consumption

good. Accepting does not guarantee acquisition: the counterpart must also accept.

Actions do not establish beliefs or a monetary convention on their own.

Good	Eligible opportunities	Declared acceptances	Acceptance (%)	Effective acquisitions
Token	41	29	70.7	23
Good 1	24	21	87.5	15
Good 2	16	12	75.0	6
Good 3	10	9	90.0	3

Figure 5.4: Token acceptance and circulation report. Continuation 1/2.

5.7 Evolution and comparisons across sessions

The graph shows encounter-level exchange rates on a common zero-to-one-hundred-percent scale. Its accompanying table identifies how many complete economies and pairs contribute each point. An encounter without data is not converted into zero. Under random horizons, late points describe surviving economies, not necessarily the opening composition. Connecting points is a descriptive aid rather than an estimate of a causal trend.

Your type	Complete decisions	Consumption	Consumptions/decisions (%)
A	60	12	20.0
B	60	11	18.3
C	60	12	20.0

	1	24	22	87.5	10	
BE	Good					ide
	2	16	12	75.0	6	
	Good					
	3	10	9	90.0	3	

Consumption by type

Your type	Complete decisions	Consumption	Consumptions / decisions (%)
A	60	12	20.0
B	60	11	18.3
C	60	12	20.0

Token transfers: 23. Token-periods: 45. Transfers per token-period: 0.511.

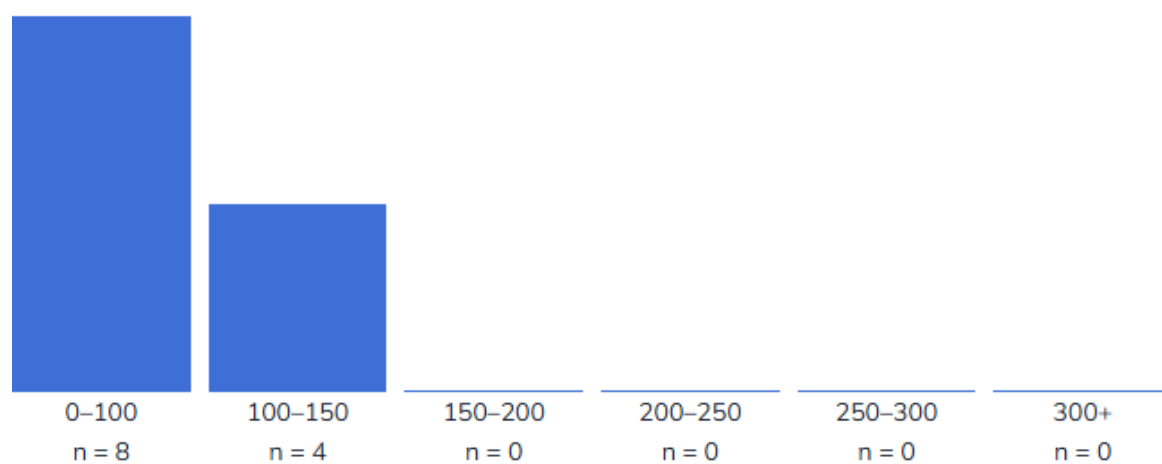
Each exchange of a token is counted once; holding is not a transfer. The denominator is token stock times complete economy-periods.

Figure 5.5: Token acceptance and circulation report. Continuation 2/2.

When comparing fixed pairs, rematching, and local networks, preserve scales and describe possible contacts. Increasing exchange may be consistent with learning, favorable inventories, or a particular calendar. Visible preferences and fee changes may also alter the opportunities presented. Do not interpret every improvement as individual learning without reconstructing choices. A multi-condition class can compare tables side by side or analyze separate exports while retaining session, economy, and period identifiers.

The assignment and dependence unit is the twelve-person economy. Treating hundreds of rows as hundreds of independent economies exaggerates the information available. Two economies in each of two treatments provide four principal units despite many repeated decisions. Discussion can clearly describe differences without claiming statistical significance. Close by requesting an alternative explanation for each pattern and a design that would test it. The graph then supports reasoning about mechanisms rather than automatically confirming initial predictions. Students should also report whether a late point is based on one surviving economy or several, since uncertainty and composition are part of its interpretation.

Distribution of final balances



Exchange over encounters

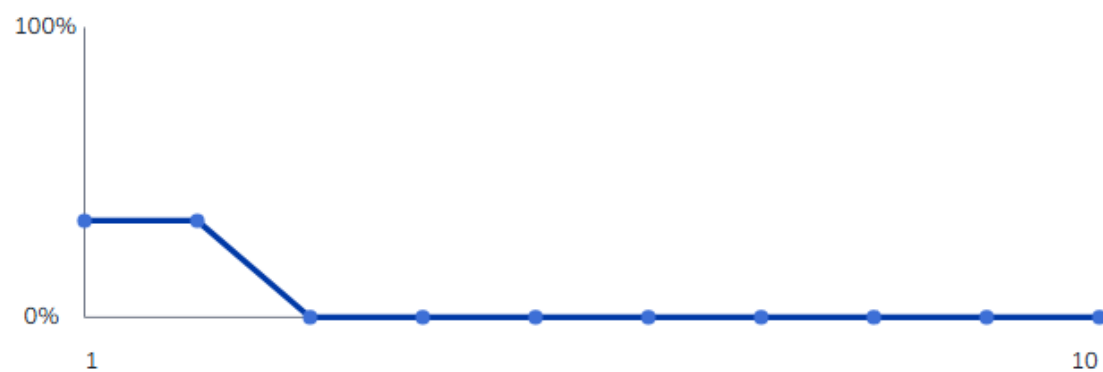


Figure 5.6: Final balances and exchange evolution.

Feedback, exercises, and support

6.1 A feedback script that starts from facts

Begin discussion by describing the report before explaining causes. Completed pairs, effective exchanges, and consumers are different quantities. Request numerators and denominators. Then select a two-encounter chain and reconstruct who held each object, who accepted, and when consumption occurred. This turns aggregate figures into decisions and constraints that students can check.

Next ask what advantage came from holding an unwanted object. Answers may include lower fees and later exchange opportunities. Require evidence for each explanation. Fees are known from the table; later use requires a trajectory; expectations of future acceptance were not elicited. This prevents an overly strong causal story based on one choice. If an object was often accepted but rarely passed, use the contrast as the central problem.

Finally connect with monetary functions. An object can mediate exchange without becoming a unit of account for all prices, since prices are not negotiated here. A large balance also does not establish an efficient monetary institution. Ask for a comparison preserving costs or encounters and for the result that would support or weaken the argument. Failure of broad circulation deserves the same analytical attention as success. Closing means understanding when an object facilitates exchange rather than celebrating that the class found a currency. A useful exit sentence names one necessary rule, one observed fact, and one explanation still requiring additional evidence.

6.2 Payoff exercise with solution

Assign a reference-cost trajectory. A type C person starts with Good 3, exchanges for Good 2 in the first encounter, rejects in the second, and obtains Good 1 in the third. In the fourth they keep newly produced Good 3 and reject again. Request closing inventory, fee, reward, and balance for every encounter. The solution must place replacement between periods three and four rather than inside period three.

In the first, C retains Good 2, pays one ECU, and ends at ninety-nine. In the second they keep Good 2, pay one, and end at ninety-eight. In the third they consume Good 1, earn ten, and pay zero; balance reaches one hundred eight and inventory becomes empty. At the start of the fourth they produce Good 3, retain it, pay two, and end at one hundred six. There is one consumption and four ECU in fees: one hundred plus ten minus four. Replacement does not earn points.

Extend the exercise by making Good 2 free to store while Good 3 still costs two, holding the trajectory fixed. Final balance becomes one hundred eight because the first two fees disappear. Decisions and consumption did not change; the difference is institutional. Then ask why the

trajectory might no longer be chosen when incentives change. Distinguish an accounting comparison holding actions fixed from a behavioral comparison allowing new actions. This is a central skill for interpreting experimental treatments rather than attributing every payoff difference to a change in strategy.

6.3 Denominator and token exercise

Consider a three-token economy completing six encounters. Eighteen exchanges of distinct objects occur among thirty-six pairs, and twenty-four consumptions among seventy-two decisions. Nine exchanges involve a token. Exchange rate is fifty percent and consumption rate is 33.3 percent. Eighteen token-periods yield operational velocity of 0.5. These three measures are not equivalent versions of one percentage.

Suppose tokens also appear in twenty eligible opportunities, are accepted fifteen times, and acquired nine times. Indirect acceptance is seventy-five percent. Six acceptances without acquisition reflect missing counterpart consent, not evidence that recipients changed preferences. A six-token economy with the same nine transfers over six encounters has velocity 0.25. Its denominator doubled although movements stayed constant.

Ask students to write one correct and one incorrect statement. It is correct that half of pairs exchanged distinct objects. It is incorrect that half of people consumed, or that seventy-five-percent acceptance guarantees circulation. Then ask what is missing to conclude that tokens improved consumption relative to no tokens. An appropriate comparison must account for institutions, duration, opportunities, and independent units; one economy's aggregates do not establish the effect. Students should propose a comparison preserving relevant features and explain why initial objects and costs need to be recorded. This exercise tests whether a familiar rate can be translated into a precise claim about observed actions.

6.4 Exports and private reconstruction

The custom export includes session, anonymous participant, economy, encounter, language, edition, treatment, matching rule, and seed. It records realized duration, continuation probability, and cap, plus type, production good, desired good, and counterpart position. Economic fields identify initial inventory, opening production, inventories before and after, offered object, acceptance, exchange, consumption, cost, balance change, and balance. These permit accounting checks without names.

Filter on completed periods before analyzing payoffs. An active pending row may contain incomplete decisions or inventories. Missing values are not replaced with zero. Technical periods after realized termination are excluded from this export. Follow a person by sorting anonymous code and encounter; follow an economy while retaining group identifier. Counterpart position only makes sense within its economy and period.

A useful audit checks three properties: token stock before and after an encounter matches; consumers finish with empty inventory and zero fee; and current balance equals previous balance plus observed change. In the first encounter, the prior reference is initial endowment. Then check that new production appears at the opening after empty closing inventory. Document exclusions and preserve an unchanged original file. Additional charts may use codes to link records, but classroom results remain aggregate and unidentified. Exports support a more detailed reconstruction than the report while preserving the distinction between an observed transition and an inferred motive.

6.5 Troubleshooting and error prevention

A prolonged wait calls for checking progress and current links rather than deleting sessions. Verify connectivity, the correct tab, and instruction reading. Someone on comprehension may have incorrect answers; someone on decisions must select a valid option. Rejection is complete and does not block progression. All twelve in an economy need to reach the same step, so an absence affects that economy, but separate economies should not be stopped through global synchronization.

Dashes in reports may be correct: settled data, eligible opportunities, or final balances may not yet exist. Read denominators before interpreting absence as zero. Opening the last technical round of a single encounter should still produce a report for its first active period. If Demo shows another family, check the instance. If a basic room offers an extended default, correct its filter before distributing links.

The best prevention is a synthetic test with a complete participant group. Check the opening, language, three types, instructions, consent, outcomes, completion, and hidden/revealed report. Do not use real student sessions to capture public documentation. Keep the offered preview active and preserve its database during restarts. If a real schema incompatibility occurs, describe its impact before recreating data. Operational support should preserve evidence instead of becoming an improvised economic intervention. A successful test also confirms that the instructor knows where to find progress without exposing individual links to the class.

For the instructor

Preserve sessions and files. A pending choice stays absent from aggregates; do not replace it with rejection or zero.

6.6 Teaching assessment and interpretive limits

A short rubric can assess four dimensions: rule reconstruction, correct accounting, denominator use, and interpretation quality. A satisfactory answer explains who consumes what, when consent is needed, and how balances arise. An advanced answer distinguishes acceptance from acquisition, costs from circulation, and evidence from beliefs. Do not grade students by experimental balances, because opportunities and encounters may differ within the same condition.

For an individual assignment, request a solved chain, a reading of two indicators, and a comparison design. The solution includes every period's fee and replacement after consumption. Interpretation names units and denominators; comparison states what changes and what remains fixed. If a student claims that a token became money, ask for an operational definition and supporting data. If they claim it could never work, ask about continuation and voluntary acceptance without inventing final redemption.

The family addresses a macroeconomic question about exchange and monetary functions. Other folders and families are consulted to avoid duplication, not to expand production into another discipline. It does not reproduce comparative advantage, where specialization and trade depend on production costs; here the main restriction is searching for a willing counterpart with suitable inventory. Nor does it reproduce bank-deposit creation or interest-rate policy. These distinctions locate the activity in a curriculum and allow later connections without confusing mechanisms. They also encourage students to transfer an explanation only after stating which institutional assumptions would change.

6.7 Pilots, validation, and specified improvements

Delivery includes mechanism tests, bots, and real interface journeys. They check whether the program implements its rules and whether conditions can complete. They do not replace a human classroom pilot or establish measured duration, universal comprehension, or guaranteed behavior. For an initial pilot, record instruction difficulties, stage timings, and recurring questions without automatically turning those notes into published research data.

Implemented extensions are sufficiently specified for teaching. Additional variants need a contract before programming: endogenous networks, expectations elicitation, heterogeneous production, or credit would require new decision and payoff rules. Do not add a condition merely to enlarge the catalog. A token version imposing acceptance, guaranteeing redemption, or rewarding holdings would answer another question and must be described as a distinct institution. This product preserves consent, fixed supply, and no terminal value.

After a class, retain condition, version, and seed with operational notes. Check whether discussion distinguished objects, scores, and monetary functions. If consumption was low, identify explanations based on opportunities or comprehension. If circulation was high, verify effective transfers rather than only declared acceptance. A grounded improvement begins with an observable learning or implementation problem, specifies a change, and repeats relevant validation. A later macroeconomic activity may connect with bank balance sheets, but that transition belongs to a different family rather than being folded into this completed game's mechanism. The catalog should preserve those distinctions so instructors can select the learning objective they need.

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