



Teacher guide to the asset market

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 helps you prepare, run, and discuss in class the **asset market** game developed for the Behavioral and Experimental Economics Research Lab (BEER Lab) of the Department of Economics at Tecnológico de Monterrey. The game follows the classic design for bubbles in experimental markets of [Smith et al. \(1988\)](#). It is aimed at instructors of intermediate microeconomics, finance, and behavioral economics, with or without prior experience in experimental economics.

The **quick guide** is enough to launch a session. The operational chapters explain each screen. The conceptual chapters present the theoretical benchmarks and the evidence needed to interpret the results. Common rules are explained only once; each variant describes only what changes relative to the baseline game.

Author

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For the instructor

This guide covers the English interface. A separate Spanish version exists. The screens in this guide were captured on a local instance of the game with simulated decisions; the numbers shown illustrate the interface and are *not* results from a class. Project only aggregate results: do not link codes to names, student IDs, seats, or individual decisions.

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Quick implementation guide

1.1 Fact sheet

Purpose	Observe whether the price of an asset follows its fundamental value —the expected value of the dividends it still has to pay— when that value falls period after period, and discuss bubbles, speculation, and learning.
Participants	Any number from 2 up; the whole class forms <i>a single market</i> . With 8 or more participants the market has enough activity. The session's number of participants must equal the number of students present.
Asset	Each participant starts with 1500 ECU in cash and 3 units. Cash and units carry over from one period to the next.
Dividend	At the end of each period, every unit pays the same random dividend: 0, 8, 28, or 60 ECU, each with probability 1/4 (mean 24 ECU).
Fundamental value	$24 \times (\text{periods left, including the current one})$: 360 ECU in period 1 of 15 and 24 ECU in the last one. After the last dividend a unit is worth nothing.
Trading	Continuous market for 120 seconds per period: bids and asks, and immediate acceptance of the best standing offer. Participants can buy and sell several times in the same period.
Earnings	Final cash minus the initial 1500 ECU (dividends collected plus the net result of buying and selling).
Duration	About 15 minutes with 5 periods (demo); about 45–50 minutes with 15 periods, not counting the debrief; with chat, up to 15 minutes more.
Instructor (you)	teaching-admin.beer-lab.org/en → the game's card → Open panel . It asks for a username and password (Section 2.1).
Students	Room link https://assetmarket.beer-lab.org/room/asset_market_en , its QR code (Section 2.5), or teaching.beer-lab.org .
Report	Average price deviation from fundamental value, total trades, price path versus fundamental value, early versus late periods, histogram of last-period prices, and a table by period.

Attention

There are two different pages. **teaching-admin.beer-lab.org** is yours: from there you enter the game's panel and download this guide. **teaching.beer-lab.org** is your students' page: from there they can only *play*, not create sessions.

1.2 Minimal sequence

Before class

1. Request panel access from lab.economia@servicios.tec.mx, stating the game, course, number of students, and date. You will receive the password for the username **admin**.
2. Open teaching-admin.beer-lab.org/en, find **Asset Market (Bubbles)**, and click **Open panel**. Enter the username and password.
3. Choose the mode: 5 periods (demo), 15 periods (classic design), or the extended variant with chat. Plan the time: 15 periods take almost an hour.
4. Rehearse in **Demo**: open the 5-period configuration and play it in several tabs to get to know the screens and the report (Section 2.3).

In class

5. Count the students present.
6. In the panel, open **Rooms** and the room **[EN] Asset Market** (or the extended one). Choose the configuration, enter the *exact* number of students in **Number of participants**, and click **Create**.
7. Share the room link or project its QR code. Each student clicks **Start**.
8. In the room, click **Monitor the session**: this opens the session page, with the **Monitor** (progress) and **Report** tabs. When the last period ends, open **Report**, click **Show results**, and lead the discussion.

After class

9. In the room, click **Close this room**. The room is then ready for the next group; the session's data are kept under **Sessions**.

1.3 Checklist

- ☐ Panel password received and tested at assetmarket.beer-lab.org/login.
- ☐ Rehearsal done in **Demo**.
- ☐ Computers, internet, browser, and projector ready.
- ☐ Mode chosen and enough class time for the number of periods (15 periods take almost an hour).
- ☐ Session's number of participants equal to the number of students present.
- ☐ Room link or QR code at hand (Section 2.5); tested from a phone.
- ☐ Made clear that ECU are experimental units and there is no cash payment.
- ☐ Monitor and report open; fundamental value path computed before revealing results.

Accessing the platform

2.1 Your access: teaching-admin and the game's panel

The instructors' page is teaching-admin.beer-lab.org/en. It does not appear in the beer-lab.org menu: type the address directly or bookmark it. It gathers all of the lab's classroom games; you can search by title, topic, or JEL code.

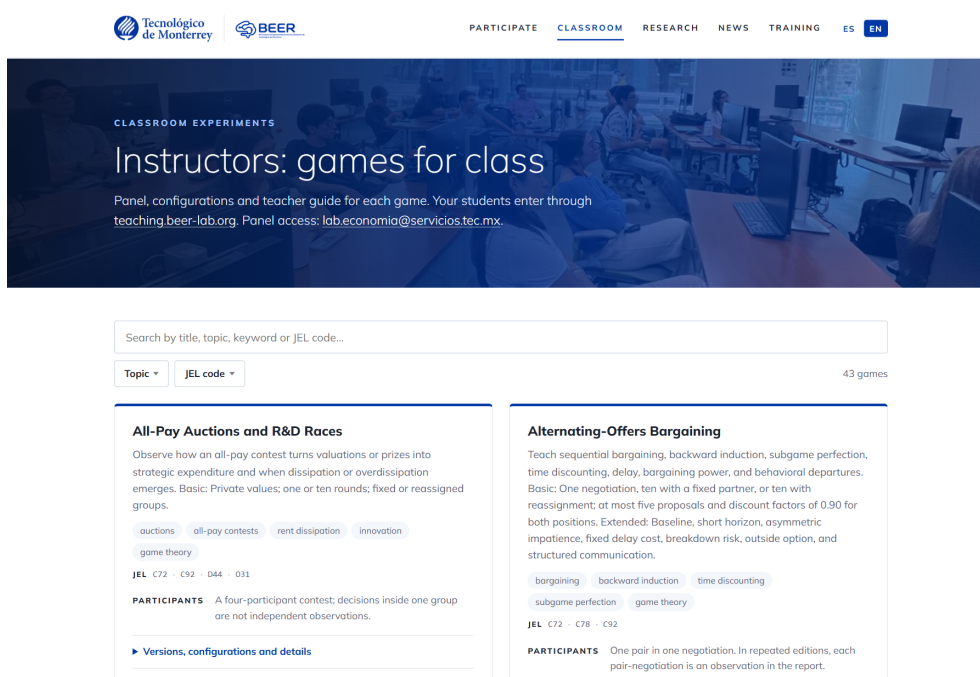


Figure 2.1: Instructors' page: teaching-admin.beer-lab.org.

Each game has a card with its description, number of participants, and duration, and two buttons: **Open panel**, which takes you to the game's panel, and **Teacher guide (PDF)**, which downloads this guide (the small **ES** link downloads the Spanish version). This game's card is called **Asset Market (Bubbles)**.

Asset Market (Bubbles)

Classic Smith, Suchanek and Williams (1988) design: an asset is bought and sold in a continuous market over several periods; at the end of each period every unit pays a random dividend (0, 8, 28 or 60 ECU) and the remaining expected value falls to zero. Cash and units carry over between periods. 5 periods (demo) or 15 periods, plus an extended version with chat.

asset markets
bubbles
fundamental value
expectations
experimental finance

JEL C92 · D53 · G12 · G41

PARTICIPANTS One market per session, no fixed roles: anyone buys or sells according to their cash and units. Works with any class size.

DURATION Approx. 15 min (5-period demo) · 60–75 min (fifteen 3-minute periods), including instructions and comprehension check.

► Versions, configurations and details

Open panel
Teacher guide (PDF)
ES

Figure 2.2: The game’s card on the instructors’ page.

Expanding **Versions, configurations and details** shows the list of rooms, with each room’s configurations. Each **open panel** link in that list goes straight to the form for creating a session in that room (after you log in).

- **Español:** [open panel](#) — configurations: *[ES] Mercado de activos — 5 periodos (demo)*, *[ES] Mercado de activos — 15 periodos*
- **English:** [open panel](#) — configurations: *[EN] Asset market — 5 periods (demo)*, *[EN] Asset market — 15 periods*
- **Español · extendido:** [open panel](#) — configurations: *[ES] Mercado de activos extendido — con chat, 15 periodos*
- **English · extended:** [open panel](#) — configurations: *[EN] Asset market extended — with chat, 15 periods*

Figure 2.3: The game’s rooms in the expanded card: basic and extended, in Spanish and English.

The game’s panel (<https://assetmarket.beer-lab.org>) is protected. **Open panel** shows the **Admin Login** screen: enter **admin** under **Username** and the password the lab gave you under **Password**. If you do not have it, request it from lab.economia@servicios.tec.mx.

Figure 2.4: Login screen of the game's panel.

2.2 The panel: minimum vocabulary

The panel is oTree's own. These are the only terms you need:

Demo	Practice sessions. Creates a session with dummy participants that you play yourself in several tabs. Use it to rehearse, never with students.
Rooms	Fixed addresses for class. Each game has four: basic and extended, in Spanish and English. Your students always join through a room.
Create / Number of participants	Create the session in the room and declare how many people will play.
Monitor	Table with the period and the screen each participant is on. It does not show decisions.
Advance slowest participants	Monitor button that moves forward whoever is lagging behind (Section 2.4).
Report	The instructor report for projecting aggregate results.
Data	Download of the data in CSV and of the chat messages.
Sessions	List of all your sessions, to go back to an earlier one.
Close this room	Frees the room when you finish, for the next group.

In this panel, **Demo** lists only this game's 6 configurations and **Rooms** only its four rooms. If another game appears, do not start the session and notify the lab.

Demo	
[ES] Mercado de activos — 5 periodos (demo)	Juegos de mercados / Market games — BEER Lab Mercado de activos / Asset market
[ES] Mercado de activos — 15 periodos	
[EN] Asset market — 5 periods (demo)	
[EN] Asset market — 15 periods	
[ES] Mercado de activos extendido — con chat, 15 periodos	
[EN] Asset market extended — with chat, 15 periods	

Figure 2.5: Demo: the game's 6 configurations (4 basic and 2 extended, in Spanish and English).

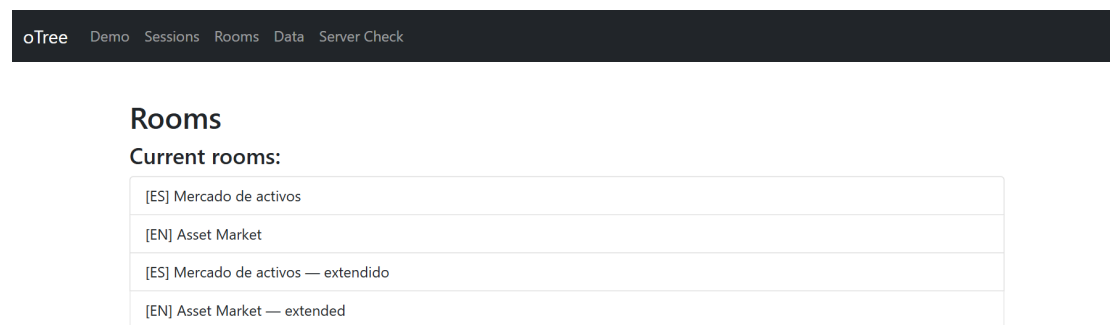


Figure 2.6: Rooms: the game's four rooms.

2.3 Rehearsing before class

In **Demo**, click a configuration: a practice session with eight participants is created and the links page appears. Open each link **P1**, **P2**, ..., **P8** in a separate tab and play as if you were each student; then open **Report**. As in class, the session is a single market and the screens without a timer wait for all eight: you will have to move forward in every tab. The 5-period configuration is the most convenient for rehearsing. These sessions do not affect your classes.

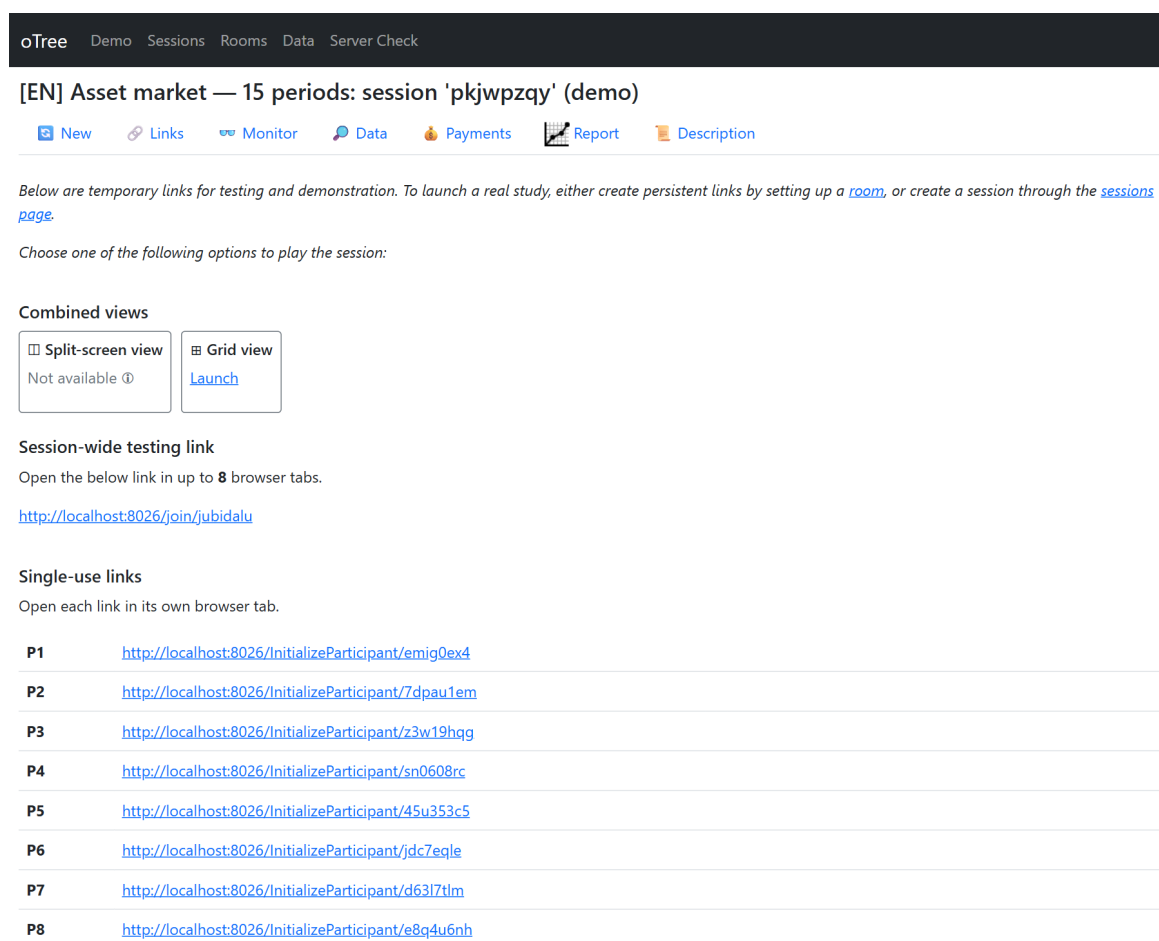


Figure 2.7: Links of a practice session with eight participants. The screenshots in this guide were taken on a local copy, which is why the addresses say `localhost`; on the server they say `assetmarket.beer-lab.org`.

Attention

Do not rehearse with the room link open in several tabs of the same browser: oTree recognizes the browser and all tabs would be the same person. To rehearse, use **Demo**.

2.4 Creating the session in class

In **Rooms**, open the room for the language you will use. The form offers only that room's configurations: the basic English room offers `asset_market_en_5_periods` and `asset_market_en_15_periods`; the extended one, `asset_market_extended_communication`. Choose the configuration, enter the number of students present in **Number of participants**, and click **Create**.

oTree Demo Sessions Rooms Data Server Check

Room: [EN] Asset Market

Create a new session

English room. Only the configurations of this game, language and edition are shown below.

Session Config

[EN] Asset market — 5 periods (demo) ▾

Number of participants

Must be a multiple of 1

Create

[Configure session](#) ⚙️

App sequence

Figure 2.8: Form of the basic English room: only its two configurations appear.

For the instructor

If the class is short, **Configure session** lets you change two parameters before creating the session: `active_rounds` (number of periods, from 1 to 15) and `trade_seconds` (trading seconds per period). The instructions, the fundamental value, and the report adjust automatically to the chosen number of periods, because that number is the horizon participants know. For example, 10 periods of 90 seconds start with a fundamental value of 240 ECU. Do not change the other fields (language, edition, treatment, chat).

The room then shows that a session is under way, with the **Monitor the session** link and the **Close this room** button.

oTree Demo Sessions Rooms Data Server Check

Room: [EN] Asset Market

Session 4mke6g7c is taking place in this room.

[Monitor the session](#) 

Close this room

Start links

These URLs will stay constant for new sessions, even if the database is recreated.

Room-wide URL

Here is the room-wide URL anyone can use. Don't use this link when testing in multiple tabs on the same browser, because all tabs will be assigned to the same participant, using a cookie.

http://localhost:8026/room/asset_market_en

Hard-coded links

Generally, you should provide your participants with the room-wide URL above. But in special cases where you need to open (or re-open) a specific participant's link, by using the participant code, you can use the below links.

► Show/Hide

Figure 2.9: Room with a session under way.

Attention

Declare the exact number, with no spare places. The lab's general guide suggests creating a few extra places; not in this game. The whole class forms a single market, and each period starts and ends when *everyone* reaches the waiting screen: if you declare more participants than actually join, the first wait never ends. If one student more than declared arrives, they will see a message in Spanish, “La sesión está llena” (the session is full), even in the English rooms; in that case, before starting, click **Close this room**, create another session with the right number, and ask everyone to open the link or QR code again.

Each period's trading time is fixed (120 seconds, unless you change it when creating the session) and there is no button to end it early, but the period result screen has no time limit: if a student disconnects or does not click **Next period**, everyone else waits. Ask them to reopen the room in the same browser: they resume where they were. If they cannot, use **Advance slowest participants** in the Monitor (it moves up to 20 participants per click to the next page). A participant who is advanced keeps their cash and units and keeps collecting dividends. Do not click that button while trading is proceeding normally: it would close the period for those who are trading.

oTree Demo Sessions Rooms Data Server Check

[EN] Asset market — 15 periods: session 'pkjwpzqy' (demo)

New Links Monitor Data Payments Report Description

ID	Code	Label	Progress	App	Round	PageName	Waiting	WaitsFor	Since	
P1	emig0ex4		7/150	asset_market	1	Trade			1m	
P2	7dpau1em		7/150	asset_market	1	Trade			1m	
P3	z3w19hgg		7/150	asset_market	1	Trade			1m	
P4	sn0608rc		7/150	asset_market	1	Trade			1m	
P5	45u353c5		7/150	asset_market	1	Trade			1m	
P6	jd7eqlq		7/150	asset_market	1	Trade			1m	
P7	d63l7lm		7/150	asset_market	1	Trade			1m	
P8	e8q4u6nh		7/150	asset_market	1	Trade			1m	

8 started, 8 in progress (total: 8)

Figure 2.10: Monitor: period and page of each participant, without showing decisions.

2.5 How your students join

Students need no account and nothing to install; the browser on their phone or computer is enough. They have three ways in, all leading to the same room:

1. **QR code.** Project the one for the room you will use (below, and full size in Appendix A). They scan it with their phone camera.
2. **Room link.** Share it in the class chat or on Canvas: https://assetmarket.beer-lab.org/room/asset_market_en.
3. **Catalogue.** On teaching.beer-lab.org they look for **Asset Market (Bubbles)** and click the button for their language (**English**, or **English · extended** if they tick **Show extended version**).

**English, basic**

`assetmarket.beer-lab.org`
`/room/asset_market_en`

**English, extended**

`assetmarket.beer-lab.org`
`/room/asset_market_extended`

**Español, básica**

`assetmarket.beer-lab.org`
`/room/asset_market_es`

**Español, extendida**

`assetmarket.beer-lab.org`
`/room/asset_market_extendido`

What participants will see

Students open the room and click **Start**. If you have not created the session yet, the room shows a short waiting message in Spanish (“Por favor espere”, please wait) and lets them in automatically once you create it; you can therefore share the link or QR code from the start of class. They need no e-mail or password: they receive an anonymous code.

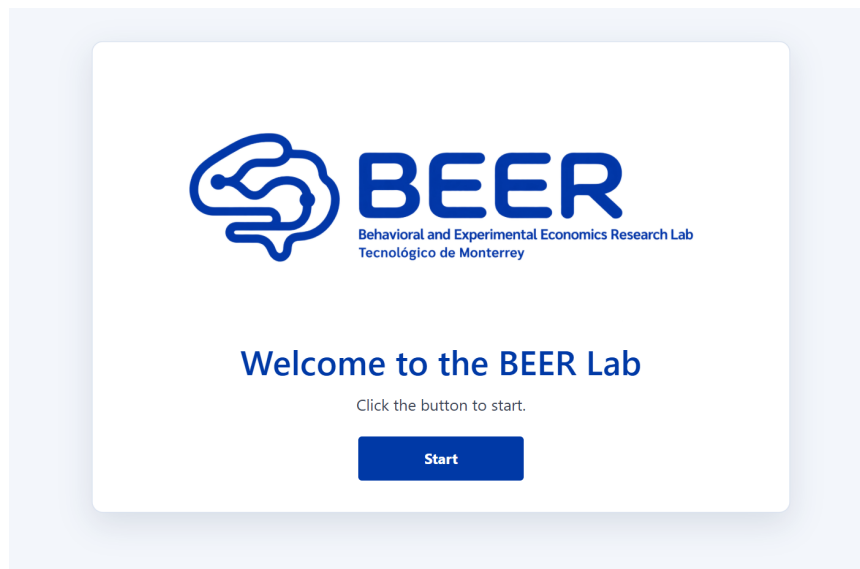


Figure 2.11: Room opened by the student.

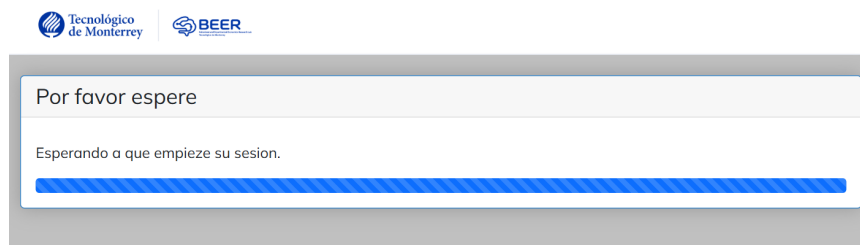


Figure 2.12: Student waiting screen if the session does not exist yet (shown in Spanish in every room).

Language is per room: a session created in the English room only admits those who join through the English room. If your group is mixed, choose one language for everyone: the whole class forms a single market.

Asset Market (Bubbles)

Classic Smith, Suchanek and Williams (1988) design: an asset is bought and sold in a continuous market over several periods; at the end of each period every unit pays a random dividend (0, 8, 28 or 60 ECU) and the remaining expected value falls to zero. Cash and units carry over between periods. 5 periods (demo) or 15 periods, plus an extended version with chat.

asset markets

bubbles

fundamental value

expectations

experimental finance

JEL C92 · D53 · G12 · G41

Address: `assetmarket.beer-lab.org`

Español

English

Español · extendido

English · extended

☒ Show extended version

Figure 2.13: The game's card on teaching.beer-lab.org, the students' page.

The baseline game and its screens

3.1 Rules, incentives, and benchmarks

There is a single asset and a single market for the whole class. Each participant starts with 1500 ECU and 3 units, and whatever they hold at the end of a period carries over to the next. At the end of each period, every unit pays the same dividend $d_t \in \{0, 8, 28, 60\}$, drawn at random with equal probability. The asset pays dividends for T periods known to everyone ($T = 15$ or $T = 5$) and is worthless afterwards. Its *fundamental value* in period t —the expected value of the dividends it still has to pay, including the current period’s— is therefore

$$V_t = 24(T - t + 1), \quad 24 = \frac{0+8+28+60}{4},$$

and it falls by 24 ECU every period. The trading screen shows this number at all times, as in the original design, where participants knew the table of expected values.

During the 120 seconds of each period anyone can buy or sell: there are no fixed roles. The only limits are budget and inventory: nobody can bid more than their cash or sell without units. There is no short selling and no borrowing. Final earnings are final cash minus 1500 ECU.

For the instructor

Before playing, ask for a prediction: if in period 1 a unit pays 24 ECU on average for 15 periods, how much would you pay for it? And in period 12? Write down the answers; they will serve as a contrast with the price path.

3.2 Cover page, instructions, and comprehension

The cover page introduces the BEER Lab and the rules of conduct. Participants confirm they have read them. The instructions describe only the action: they do not mention “bubble”, “fundamental value”, or “speculation”, nor suggest at what price to trade. Instead of “fundamental value” they say “expected value of the dividends a unit still has left to pay”, which is exactly what that number is.



Welcome to the BEER Lab

The **Behavioral and Experimental Economics Research Lab** of the Department of Economics at Tecnológico de Monterrey is a space for learning about economic decisions through controlled activities.

Today you will take part in a market where an asset is bought and sold over several periods. Your earnings depend on your decisions.

During the session

- Do not talk or communicate with other people, except through the means shown on screen.
- Make your decisions individually.
- Follow the on-screen instructions. Do not refresh or close this page.
- If you need help, raise your hand.

I have read and understood the lab rules.

☐ Yes ☐ No

Start

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Figure 3.1: Cover page and lab rules.

Instructions

Period 1 of 15

You take part in a market where a single kind of asset is bought and sold, over 15 periods.

You start with 1500 ECU in cash and 3 units of the asset. Unlike other activities, whatever you have at the end of a period (cash and units) carries over to the next one: it does not reset each period.

At the end of every period, each unit you hold at that moment pays a random dividend. The dividend is one of these values, each equally likely: 0, 8, 28, 60 ECU (the average is 24 ECU). The dividend is the same for every unit and every person that period; only the number of units each person holds differs.

The asset will pay dividends for 15 periods in total; after that, it is worth nothing. Because of this, the expected value of the dividends a unit still has left to pay falls every period: at the start it is $15 \times 24 = 360$ ECU; in the last period, only 24 ECU.

How trading works

- Each period lasts 120 seconds. You can propose a price to buy at (a bid) or a price to sell at (an ask) at any time; everyone sees the two best current offers.
- A new bid is only accepted on screen if it is higher than the current best bid. A new ask is only accepted if it is lower than the current best ask.
- At any time you can accept the current best bid (to sell) or the current best ask (to buy). Accepting closes the trade immediately at that price.
- Unlike other activities, here you can buy and sell several times during the same period, as long as you have enough cash to buy or enough units to sell. The system will not let you offer to buy more than your cash, or sell more units than you have.

Example

If there are 6 periods left (including this one), the expected value of the dividends a unit still has left to pay is $6 \times 24 = 144$ ECU.

If you buy a unit for 100 ECU, collect a dividend of 28 ECU while you hold it, and then sell it for 250 ECU, your earnings from that unit are $250 - 100 + 28 = 178$ ECU.

- There will be 15 periods. Your earnings from all periods are added up: at the end, your total earnings are your final cash minus the 1500 ECU you started with.
- Amounts are in ECU (experimental currency units). There is no cash payment.

Continue

Powered by [gTrex](#)

Figure 3.2: Instructions: endowment, dividend, expected remaining value, trading rules, and example.

The example uses 6 periods left (expected value $6 \times 24 = 144$ ECU) and a unit bought at 100 that collects a dividend of 28 and is sold at 250 (earnings $250 - 100 + 28 = 178$ ECU). These numbers do not match the endowment or the initial fundamental value of any configuration, so that the example does not act as a price anchor. The comprehension check asks for these same two results; after a mistake it explains the rule and lets the participant try again. The number of attempts is recorded in the data.




Before you start

Period 1 of 15

Answer based on the instructions.

If there are 6 periods left (including this one), what is the expected value of the dividends a unit still has left to pay?

☐ 24 ECU

☐ 36 ECU

☐ 144 ECU

☐ 168 ECU

If you buy a unit for 100, collect a dividend of 28 while you hold it, and then sell it for 250, what are your earnings from that unit?

☐ 28 ECU

☐ 122 ECU

☐ 150 ECU

☐ 178 ECU

Check

Powered by [oTree](#)

Figure 3.3: Comprehension check.




Por favor corrija los errores.

Before you start

Period 1 of 15

Answer based on the instructions.

If there are 6 periods left (including this one), what is the expected value of the dividends a unit still has left to pay?

☐ 24 ECU

☐ 36 ECU

☐ 144 ECU

☐ 168 ECU

Check: multiply the periods left (including this one) by the average dividend (24).

If you buy a unit for 100, collect a dividend of 28 while you hold it, and then sell it for 250, what are your earnings from that unit?

☐ 28 ECU

☐ 122 ECU

☐ 150 ECU

☐ 178 ECU

Check: selling price – buying price + dividends collected while you held it.

Check

Powered by [oTree](#)

Figure 3.4: Wrong answers: the message recalls the rule without giving the answer.

3.3 Waiting, trading, and results

Before each period, the screen waits until the whole group is ready. At that point the cash and units from the previous period carry over to the new one.

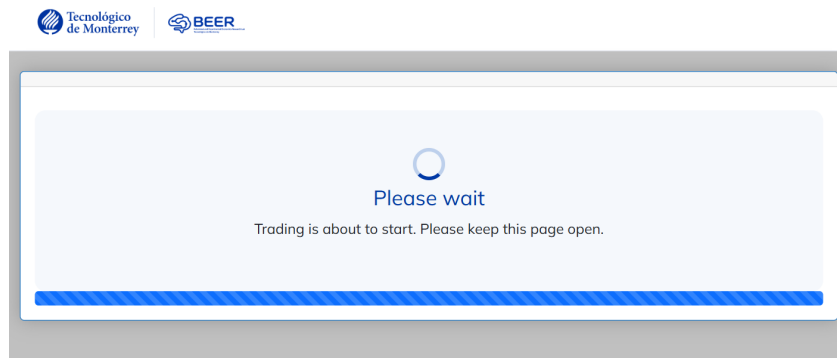


Figure 3.5: Waiting at the start of the period.

What participants will see

“Please wait” means that other people in the market are not ready yet. It is not an error. Participants should not close or refresh the page.

The trading screen shows the time left, the participant’s own cash and units, the periods left, the expected value of the remaining dividends, the best standing bid and best standing ask, and the list of trades closed in the period. The participant can:

- **Offer to buy** at a price: accepted only if it improves on (exceeds) the best standing bid and does not exceed their cash.
- **Offer to sell** at a price: accepted only if it improves on (is lower than) the best standing ask and they hold at least one unit.
- **Buy at the best ask or Sell at the best bid**: the trade closes immediately, for one unit, at the price of the accepted offer.

Each trade clears both standing offers; the market starts again with no offers. Nobody can accept their own offer.

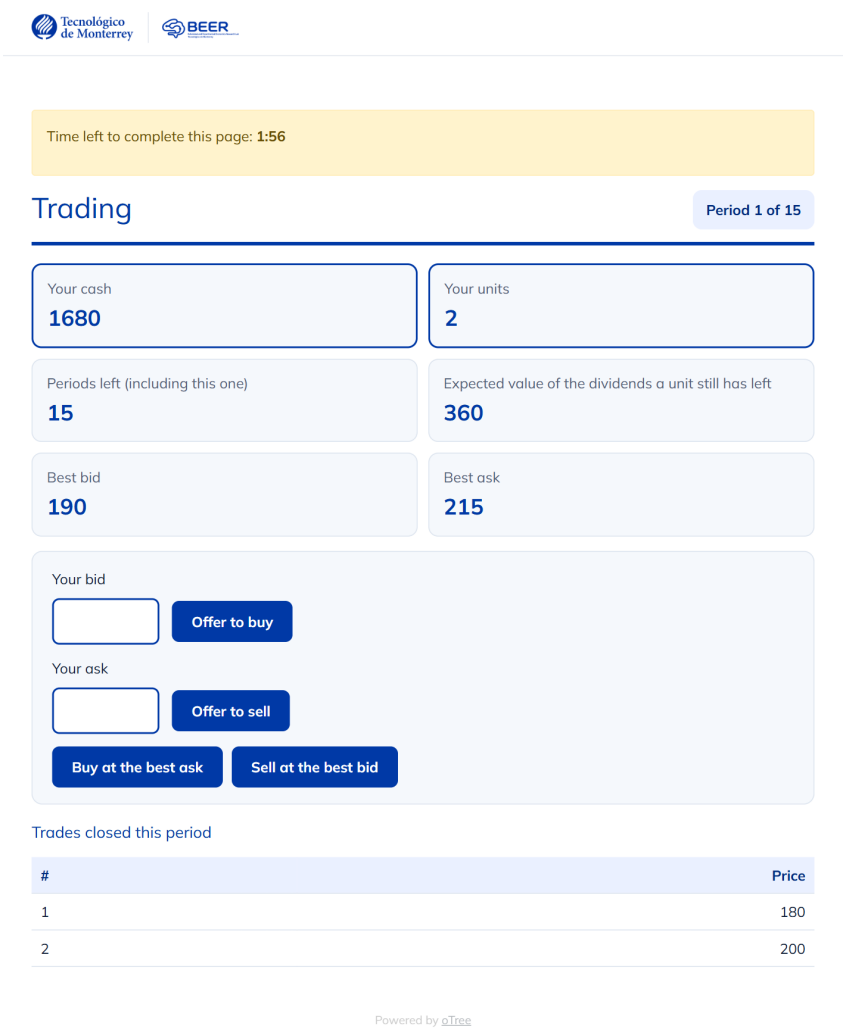


Figure 3.6: Trading in period 1: standing offers and closed trades (simulated decisions).



Time left to complete this page: 1:54

Trading

Period 1 of 15

Your cash
1680

Your units
2

Periods left (including this one)
15

Expected value of the dividends a unit still has left
360

Best bid
190

Best ask
215

Your bid must be higher than the current one and cannot exceed your cash.

Your bid

185

Offer to buy

Your ask

Offer to sell

Buy at the best ask

Sell at the best bid

Trades closed this period

#	Price
1	180
2	200

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Figure 3.7: A bid that does not improve on the standing one is rejected with a notice.




Time left to complete this page: 1:56

Trading

Period 8 of 15

Your cash
1649

Your units
3

Periods left (including this one)
8

Expected value of the dividends a unit still has left
192

Best bid
340

Best ask
365

Your bid

 Your ask

Offer to buy

Offer to sell

Buy at the best ask

Sell at the best bid

Trades closed this period

#	Price
1	360
2	355

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Figure 3.8: Trading in period 8: the expected remaining value is already 192 ECU (simulated decisions).

When time runs out the dividend is paid and the period result appears: cash and units at the start, dividend received (dividend per unit times units held at the end), expected value of the remaining dividends at the start of the period, average price in the period, cash and units at the end, cumulative earnings, and the list of all trades. The “Cash after trading” box already includes the period’s dividend: in figure 3.9, $1500 + 180$ (one unit sold) $+ 56$ (2 units $\times 28$) $= 1736$ ECU.

Period result

Period 1 of 15

Cash at the start of the period

1500

Units at the start of the period

3

Dividend received

56 ECU

Expected value of remaining dividends

360

Average price this period

205

Cash after trading

1736

Units after trading

2

Cumulative earnings

236 ECU

All trades this period

#	Price
1	180
2	200
3	215
4	210
5	220

Next period

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Figure 3.9: Result of period 1 (simulated decisions).

What participants will see

“Cumulative earnings” are current cash minus 1500 ECU. They do not include the value of the units the participant still holds; this is why someone who buys units may see negative cumulative earnings mid-session. At the end, when units are worthless, that figure is the total earnings. If a student asks, explain this without suggesting what to do.

End of the activity

Period 15 of 15

Your total earnings

815 ECU

Period	Starting cash	Starting units	Ending cash	Ending units	Dividend	Expected remaining value	Average price
1	1500	3	1736	2	56	360	205
2	1736	2	1535	3	24	336	228.8
3	1535	3	1780	2	0	312	257.5
4	1780	2	1670	3	180	288	291.2
5	1670	3	1975	2	0	264	317.5
6	1975	2	1659	3	24	240	341.2
7	1659	3	2004	2	0	216	352.5
8	2004	2	1829	3	180	192	355
9	1829	3	2225	2	56	168	330
10	2225	2	1974	3	24	144	288.3
11	1974	3	2304	2	120	120	230
12	2304	2	2320	2	16	96	163.3
13	2320	2	2244	3	24	72	103.3
14	2244	3	2299	2	0	48	56.7
15	2299	2	2315	2	16	24	25

Thank you for participating. Please wait for your instructor.

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Figure 3.10: End screen: total earnings and history of the 15 periods (simulated decisions).

In the history, the “Dividend” column is the total dividend received in the period (dividend per unit times number of units), and “Ending cash” already includes it.

Instructor report and debrief

4.1 When to reveal

Report is a tab of the session page: reach it from the room with **Monitor the session**, or from **Sessions** if the session has already ended. It opens with results hidden. At the top it shows participants, completed periods, and whether the current period is unfinished. You can therefore project it from the start without giving anything away. Click **Show results** when the last period ends; **Refresh** adds new periods and **Hide results** covers them again. Do not reveal the chart between periods: seeing the path would change the class's expectations.

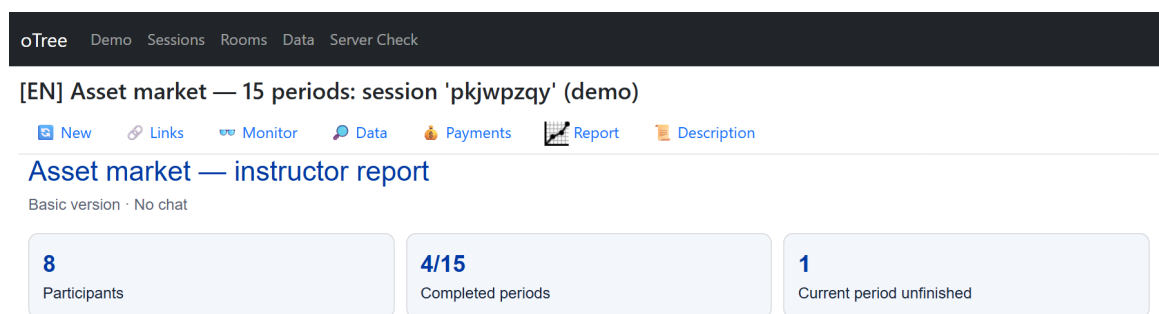


Figure 4.1: Report with results hidden and progress counter.

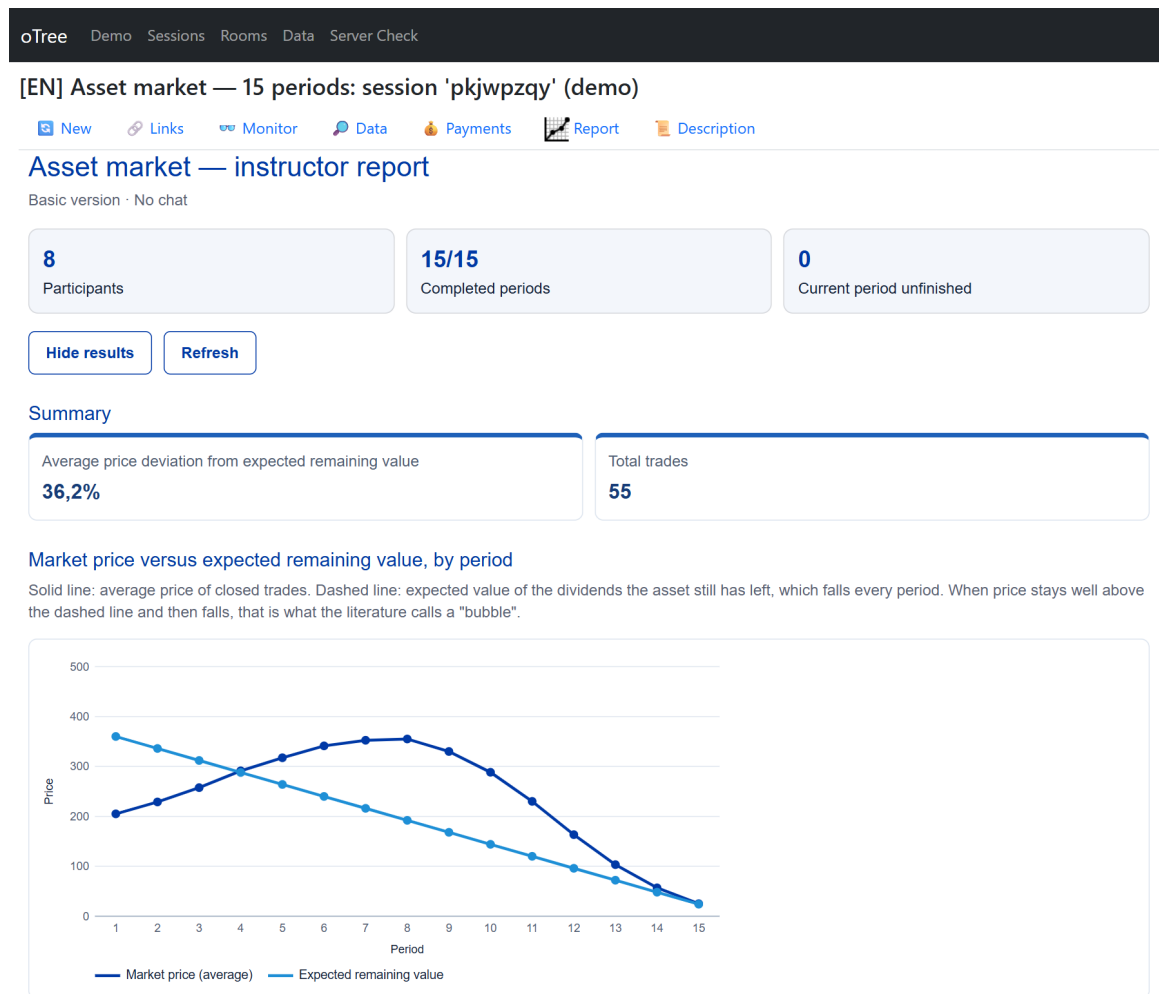


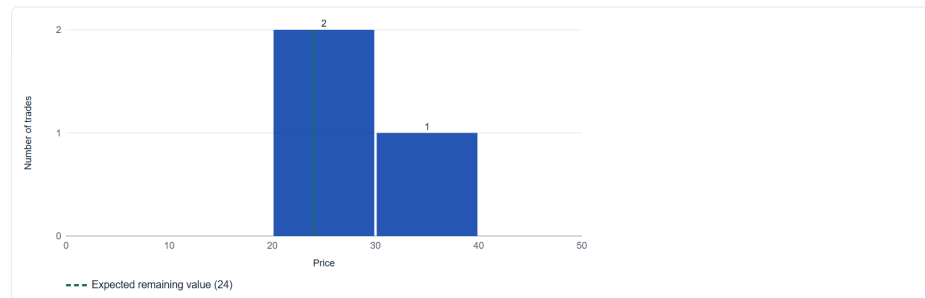
Figure 4.2: Revealed report: summary and average price versus expected remaining value by period (simulated decisions).

Early periods versus late periods (price deviation)

	Deviation (%)
Periods 1–3	-30,8%
Periods 13–15	21,9%

Distribution of trade prices

Trade prices in the last completed period.



Results by period

Period	Trades	Dividend	Expected remaining value	Average price	Deviation (%)
1	5	28	360	205	-43,1%
2	4	8	336	228,8	-31,9%
3	4	0	312	257,5	-17,5%
4	4	60	288	291,2	1,1%
5	4	0	264	317,5	20,3%
6	4	8	240	341,2	42,2%
7	4	0	216	352,5	63,2%
8	5	60	192	355	84,9%
9	3	28	168	330	96,4%
10	3	8	144	288,3	100,2%
11	3	60	120	230	91,7%
12	3	8	96	163,3	70,1%
13	3	8	72	103,3	43,5%
14	3	0	48	56,7	18,1%
15	3	8	24	25	4,2%

Individual data: Data → Custom export (asset_market). Chat messages: Data → Chat.

Figure 4.3: Revealed report: early versus late periods, histogram of last-period prices, and table by period (simulated decisions).

4.2 How to read the report

1. Start with the chart: the dark blue line is the average price of each period's trades and the light blue line the expected remaining value, which falls by 24 ECU per period (the note on the page refers to a "dashed" line, but both lines are drawn solid). A period without trades has no price.
2. Each period's deviation is $(\bar{p}_t - V_t)/V_t$ in percent, and the summary averages those deviations. Because V_t is small at the end (24 ECU in the last period), a difference of a few ECU becomes a large percentage: read the average deviation together with the table, not on its own.
3. The early-versus-late table (from 6 completed periods on) compares the deviation in periods 1–3 with that in the last three.
4. The histogram shows the prices of all trades in the last completed period, with a line at its expected remaining value: it shows whether the final "crash" was general or whether some

trades stayed well above.

5. The table by period includes the dividend drawn. Use it to ask whether prices reacted to high or low dividends, even though the expected value does not depend on them.

The English report currently prints percentages with a decimal comma (for example, “36,2%”), as in the Spanish interface.

Debrief script

First ask how much they would have paid for a unit in period 1 and in period 12. Then reveal the chart. Ask those who bought at high prices mid-session and those who sold to explain their reasoning, without singling anyone out: did they buy to collect dividends or to resell? Finish by computing the fundamental value path together on the board.

Theory and evidence

5.1 Theoretical benchmarks

Theoretical foundation

A unit held from the start of period t to the end pays $d_t + d_{t+1} + \dots + d_T$. With independent dividends of mean 24, its expected value is $V_t = 24(T - t + 1)$. A risk-neutral person who plans to hold the unit would not pay more than V_t nor sell for less; a risk-averse person would pay less. If everyone is rational and knows it, backward induction pins down the price: in the last period nobody pays more than 24; knowing that, in the second-to-last nobody pays more than 48, and so on back to period 1. Paying more than V_t only makes sense if one expects to resell at a higher price to someone else before the value runs out. A price that stays well above V_t for several periods and then falls towards it is what the literature calls a *bubble* followed by a *crash*.

Period t	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$V_t (T = 15)$	360	336	312	288	264	240	216	192	168	144	120	96	72	48	24
$V_t (T = 5)$	120	96	72	48	24										

Two accounting facts help in the discussion. First, buying and selling is zero-sum: what someone who sells high gains, someone who buys high loses. The class's total earnings are exactly the sum of dividends paid, $3N \sum_t d_t$ with N participants, whose expected value is $3N \times 360 = 1080N$ ECU with 15 periods. Second, total cash grows with every dividend while the value of the units falls: at the start there are 1500 ECU of cash for every $3 \times 360 = 1080$ ECU of fundamental value, and that ratio rises period after period. Plenty of cash relative to a depreciating asset is an environment prone to bubbles (Kirchler et al., 2012; Palan, 2013).

5.2 Experimental evidence

Smith et al. (1988) designed this market: an asset with a random dividend (0, 8, 28, or 60 cents) over 15 periods and a declining fundamental value known to everyone. In most of their markets with inexperienced participants, the price started below the fundamental value, rose well above it mid-session, and fell sharply near the end. When the same group repeated the market, bubbles were smaller. Porter and Smith (1995) show that bubbles persist even when dividend uncertainty is removed, and that introducing a futures market dampens them.

Lei et al. (2001) find bubbles even when nobody can resell what they buy, so that speculation is impossible: part of the phenomenon is due to decision errors and not only to the expectation of finding someone who will pay more. Kirchler et al. (2012) attribute much of the bubble phenomenon to confusion about the declining value: when the same asset is framed as shares in a depletable gold mine, bubbles are markedly smaller. Haruvy and Noussair (2006) allow short selling: prices fall, but bubbles do not disappear.

Experience is the most robust factor. Dufwenberg et al. (2005) show that it is enough for a fraction of participants (one third or two thirds) to have played before for bubbles to almost vanish. The surveys by Palan (2013) and Noussair and Tucker (2013) summarize these and other regularities; Holt (2019) describes classroom versions of the experiment.

5.3 Regularities worth discussing

- With inexperienced participants, the price often starts below the fundamental value, rises above it mid-session, and falls near the end.
- Trading volume is usually high even though everyone has the same information and the same endowment.
- Prices tend to move closer to the fundamental value when the same group repeats the market.
- The dividend drawn does not change the expected remaining value, but it sometimes moves the next period's prices.

Attention

The results of one class are descriptive. A single session is a single market: prices in successive periods are not independent observations, and there is no way to separate the effect of the group from the effect of the design. Whether or not your class shows a bubble neither confirms nor refutes the literature; without several comparable sessions, the effect of any treatment cannot be estimated.

Baseline modes

Both baseline modes use the rules of Chapter 3 and have no chat.

6.1 Five periods (demo)

`asset_market_en_5_periods` has a horizon of 5 periods: the fundamental value starts at 120 ECU and falls to 24. It takes about 15 minutes. It is useful for teaching the mechanics, for rehearsals, or for a short class, but it is unlikely to show a full bubble, and the report does not include the early-versus-late table (which requires 6 completed periods).

6.2 Fifteen periods

`asset_market_en_15_periods` reproduces the classic horizon of [Smith et al. \(1988\)](#): a fundamental value of 360 ECU in period 1. This is the mode for observing the full path. Set aside almost an hour for the game and schedule the debrief in the same session or the next one, with the report saved.

For the instructor

If you can devote two sessions, repeat the market with the same group in the next class. The comparison between the first and second sessions illustrates the effect of experience, the most robust result in this literature. Remember that a comparison between two sessions is illustrative, not causal.

Extended variants

7.1 Treatment map

Variant	What changes	Teaching question
Communication	Group chat for 60 s before each period; 15 periods	Does talking dampen the bubble (sharing the expected-value calculation) or amplify it (contagious optimism)?

7.2 Communication

`asset_market_extended_communication` is identical to the 15-period mode, but before each period the whole market can write to each other for 60 seconds in an anonymous chat. All messages appear under the same name (“Participant”), so nobody can tell who wrote what. Nothing written is binding. The **Go to trading** button lets participants leave the chat early; trading starts when the whole group has left or time has run out. The variant adds up to 15 minutes to the session.

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Time left to complete this page: 0:56

Messages Period 1 of 15

You can write to the whole group. You have 60 seconds. Do not write your name or any personal information.

Participant: What price would you sell at?
 Participant: I will sell if someone pays more than 300.
 Participant: There are still many dividend periods left.

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Figure 7.1: Chat before the period (demo messages).

Unlike the oligopoly games, where chat facilitates collusion, here there is no single theoretical prediction: communication may spread the expected-value calculation and moderate prices, or coordinate optimistic expectations. It is an empirical question to discuss with the session's own data.

Debrief script

Compare the path with that of a session without chat, if you have one. Read aloud, without identifying anyone, some messages (**Data** → **Chat**): did anyone compute the expected value? Did anyone announce that the price would rise? Relate this to the role of rumors and social media in financial markets.

Class plan and interpretation

8.1 Suggested session

With 15 periods of 120 seconds, trading takes about 40 minutes. In a 50–60 minute class, use the 5-period mode or reduce `active_rounds` or `trade_seconds` when creating the session (Chapter 2); if you want the full horizon, devote the class to the game and debrief in the next one. The plan below assumes 10 periods of 90 seconds.

0–5 min	Joining the room and lab rules.
5–12 min	Instructions, example, and comprehension check.
12–35 min	Ten trading periods. Do not reveal the report between periods.
35–38 min	Class predictions: how much is a unit worth in period 1 and in period 8?
38–48 min	Chart of price versus fundamental value, histogram, and table by period.
48–55 min	Fundamental value and backward induction on the board; published evidence.
55–60 min	Applications: historical bubbles, speculation, and learning.

8.2 Questions to guide the discussion

1. How much is a unit worth at the start of period 1? And at the start of the last period? Why does it fall?
2. In which periods did people pay more than the expected remaining value? Why would anyone buy at that price?
3. If you buy above the expected value, who does your profit depend on?
4. When did the price start to fall? Did anyone anticipate it and sell earlier?
5. Did high or low dividends influence the next period's prices?
6. If you played again with the same group, what would you do differently?
7. Which real episodes resemble this market: technology stocks in 2000, housing in 2006, cryptocurrencies?

8.3 Common misreadings

Hasty reading	Correction
If the price rises, the asset is worth more.	The fundamental value falls every period by construction; the price can drift away from it.
Those who bought high were irrational.	Buying above the fundamental value can be rational if one expects to resell higher; the problem is that not everyone can.
The market as a whole gained from the bubble.	Buying and selling is zero-sum: the class's total earnings are just the sum of dividends.
A high dividend makes units more valuable.	Dividends are independent: the expected remaining value does not change with the dividend drawn.
The bubble proves that markets do not work.	It is a result about inexperienced participants trading an asset with declining value; with experience, prices move closer to the fundamental value.
A difference between two classes is causal.	This requires comparable assignment and several independent markets; one session is one market.

Operations, privacy, and troubleshooting

9.1 Privacy and conduct

- Do not ask for names, student IDs, or demographic information during this activity.
- Project the aggregate report. Keep codes, screens, and individual earnings private.
- Ask students not to write personal information in the chat; the screen itself reminds them.
- Do not use the session to grade anyone on their earnings.
- Treat the session as a teaching activity, unless there is a research protocol with specific consent.

9.2 Common problems

Situation	Action
I went to <code>teaching.beer-lab.org</code> and cannot see how to create the session	That is the students' page. Use <code>teaching-admin.beer-lab.org/en</code> → Open panel .
The panel asks for a username and password	Username admin and the lab's password. If you do not have it, write to <code>lab.economia@servicios.tec.mx</code> .
"Por favor espere" (please wait, in Spanish) before starting	You have not yet created the session in that room, or the student opened another room (other language or edition). Once you create it, they get in automatically.
"Please wait" before period 1 that never ends	More participants were declared than joined, or someone has not finished the comprehension check. Check Monitor ; if people are missing, close the room (Close this room) and create a new session with the right number.
"Please wait" between periods	Someone has not clicked Next period or has disconnected. Ask them to continue or to reopen the room in the same browser; if they cannot, use Advance slowest participants .
"La sesión está llena" (the session is full, shown in Spanish)	More students joined than were declared. Before starting: Close this room , a new session with the right number, and everyone opens the link again.
Several tabs of the same browser are the same participant	This is normal with the room link. To rehearse, use Demo .
"Your bid must be higher than the current one..."	The bid does not improve on the standing one or exceeds available cash. It is a rule, not an error.
"You have no units to sell"	The participant sold all their units; they can buy again.
Negative cumulative earnings mid-session	They are cash minus 1500 and do not count units held. At the end they equal total earnings.
Not Found on a <code>/p/...</code> link	The individual link belongs to a previous session. Share the room again (link or QR code), not the individual link.
I want to see a session from another day	Panel → Sessions → the session → Report or Data .
Report without data	The first period has not ended yet. Wait and click Refresh .
A period without a price in the chart	There were no trades in that period. It is a possible outcome, not an error.

9.3 Data for later analysis

Data → **Custom export (asset_market)** provides one row per participant and period: session, anonymous code, period, language, edition, treatment, chat, cash and units at the start of the period, cash and units at the end (ending cash already includes the period's dividend), dividend received, the period's expected remaining value, and comprehension-check attempts. This export does not include the price of each trade; the average price and number of trades per period are in the report's table. Chat messages are in **Data** → **Chat**. Treat the periods of a session as

dependent: together they form a single market.

Annotated bibliography

- [Smith et al. \(1988\)](#): original design; bubbles and crashes with inexperienced participants.
- [Porter and Smith \(1995\)](#): dividend uncertainty and futures markets.
- [Lei et al. \(2001\)](#): bubbles without the possibility of speculation.
- [Dufwenberg et al. \(2005\)](#): a fraction of experienced participants is enough to reduce bubbles.
- [Haruvy and Noussair \(2006\)](#): short selling and bubbles.
- [Kirchler et al. \(2012\)](#): confusion about the declining value as a cause of bubbles.
- [Palan \(2013\)](#) and [Noussair and Tucker \(2013\)](#): surveys of the literature.
- [Holt \(2019\)](#): market experiments for the classroom.

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- Smith, V. L., Suchanek, G. L., and Williams, A. W. (1988). Bubbles, crashes, and endogenous expectations in experimental spot asset markets. *Econometrica*, 56(5), 1119–1151. doi:[10.2307/1911361](https://doi.org/10.2307/1911361).

Room QR codes

Project or print the page for the room you will use. Students scan it with their phone camera and click **Start** (**Comenzar** in the Spanish rooms).

Asset market

English room



assetmarket.beer-lab.org/room/asset_market_en

Scan the code and press **Start**.

Asset market

English room, extended version



`assetmarket.beer-lab.org/room/asset_market_extended`

Scan the code and press **Start**.

Asset market

Sala en español



assetmarket.beer-lab.org/room/asset_market_es

Escanee el código y pulse **Comenzar**.

Asset market

Sala en español, versión extendida



`assetmarket.beer-lab.org/room/asset_market_extendido`

Escanee el código y pulse **Comenzar**.