



Teacher guide for the ordering-under-uncertain-demand (newsvendor) game

Lab implementation, theoretical background,
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 lets you prepare, run and discuss the **ordering under uncertain demand** game (the “newsvendor” problem) developed for the Behavioral and Experimental Economics Research Lab (BEER Lab) at the Department of Economics, Tecnológico de Monterrey. It is written for instructors of intermediate microeconomics, industrial organization, operations management and behavioral economics, with or without prior experience in experimental economics.

The game is a teaching adaptation of Charles Holt’s classroom version (the newsvendor option of the Veconlab “Supply Chain” program) of the experimental design of [Schweitzer and Cachon \(2000\)](#). It follows that version’s structure and logic (a fixed price, a known uniform demand, one high and one low margin); the specific parameters, the wording of the screens and the text of this guide are our own.

The **quick-start chapter** gets a session running. The operational chapters explain every screen. The conceptual chapters give the theoretical background and evidence needed to interpret results. Shared rules are explained once; each variant lists only what changes relative to the basic game.

Author

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For the instructor

This guide matches the English interface. A separate Spanish version exists. Screenshots in this guide were taken on a local instance of the game with simulated decisions; the numbers shown illustrate the interface and are *not* results from a real class. Project only aggregate results: never link participant codes to names, student IDs, seats or individual decisions.

This game is still being prepared for the lab server. The access steps in Chapter 2 and the screen sequence in Chapter 3 are already final (tested on an identical copy of the game); only the screenshots of YOUR game’s card, login and rooms on teaching-admin.beer-lab.org and teaching.beer-lab.org are still missing — this guide will add them once the game goes live on those sites.

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Quick-start guide

1.1 Fact sheet

Purpose	Show how to choose an order quantity when demand is uncertain and leftovers are lost (the “critical fractile” rule), and the classic bias: orders lean toward mean demand, falling short with a high margin and overshooting with a low margin.
Participants	Any number (1, 2, odd, 30–35...). Each person decides alone: there are no pairs or markets.
Decision	Each round, every participant orders a whole number of units between 0 and 300 before demand is known.
Demand	A whole number between 1 and 300, all equally likely, drawn anew each round and <i>the same for the whole class</i> in that round. It is revealed once the whole class has ordered.
Earnings	$12 \times \min(\text{order}, \text{demand}) - c \times \text{order}$, with unit cost $c = 3$ (high margin) or $c = 9$ (low margin). Unsold units are worth nothing. Earnings can be negative.
Benchmarks	Optimal order (risk neutral): 225–226 at cost 3; 75–76 at cost 9. Mean demand: 150.5.
Duration	5 minutes for one round; 15–20 minutes for 10 rounds; 25–30 minutes for 20 rounds, not counting discussion.
Instructor (you)	teaching-admin.beer-lab.org/en → the game’s card → Open panel . Asks for username and password (section 2.1).
Students	Room link https://newsvendor.beer-lab.org/room/newsvendor_en , its QR code (section 2.5) or teaching.beer-lab.org .
Report	Benchmark per condition (critical fractile, optimal order, expected profits), average and median order, pull to the center, expected and realized earnings, round-by-round chart, first and last round, histogram of orders and table by round.

Note

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’: from there one 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 **admin** user.
2. Open teaching-admin.beer-lab.org/en, find **Ordering under uncertain demand** and click **Open panel**. Enter username and password.
3. Rehearse in **Demo**: open a configuration and play it in several tabs to see the screens and the report (section 2.3).

In class

4. Count the students present.
5. In the panel, open **Rooms** and the room **[EN] Ordering under Uncertain Demand** (or the extended one). Choose the configuration, type the *exact* number of students under **Number of participants** and click **Create**.
6. Share the room link or project its QR code. Each student clicks **Start**.
7. In the room, click **Monitor the session**: the session page opens, with the **Monitor** (progress) and **Report** tabs. When done, open **Report**, click **Show results** and lead the discussion.

After class

8. In the room, click **Close this room**. It is then ready for the next group; the session's data stay under **Sessions**.

1.3 Checklist

- ☐ Panel password received and tested at newsvendor.beer-lab.org/login.
- ☐ Rehearsal done in **Demo**, with at least two complete rounds and the report open.
- ☐ Devices, internet, browser and projector ready.
- ☐ Configuration chosen: high or low margin (10 rounds), one round (short demonstration), or 20 rounds with a cost change (extended room, recommended if you have 50 minutes).
- ☐ Number of participants equal to the number of students present.
- ☐ Room link or QR code at hand (section 2.5); tested from a phone.
- ☐ Students told that ECU are experimental units and there is no cash payment.
- ☐ Monitor and report open; the critical-fractile rule ready for the wrap-up (section 5.1).

Platform access

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

The instructor 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 lists every classroom game in the lab; you can search by title, topic or JEL code.

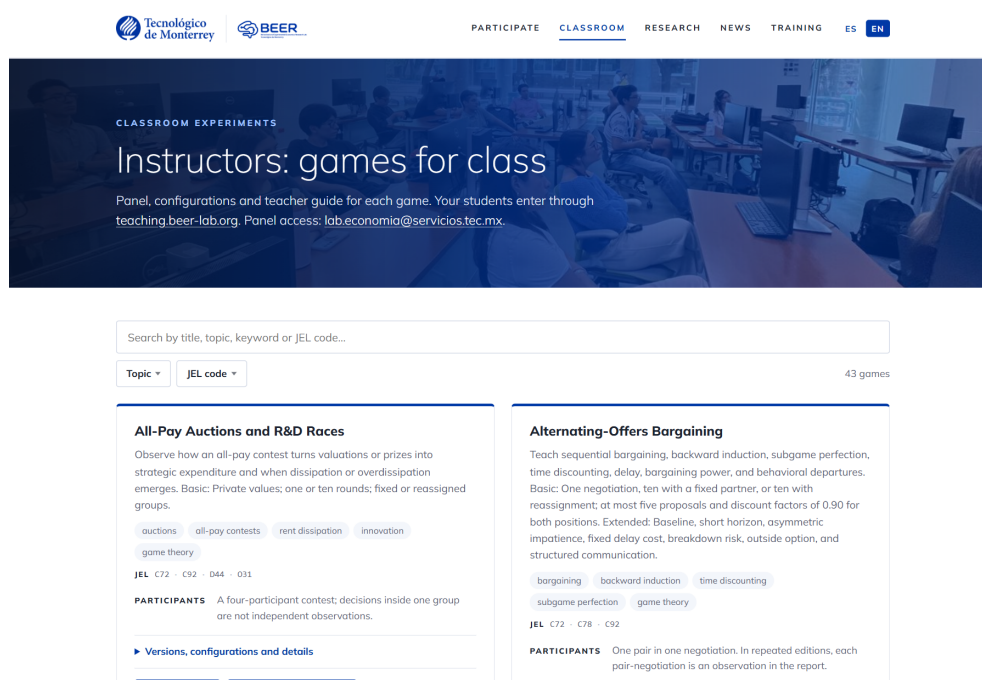


Figure 2.1: Instructor page: teaching-admin.beer-lab.org. Once this game goes live, its card will appear in this same directory (search for **Ordering under uncertain demand**).

Each game has a card with its description, number of participants and duration, and two buttons: **Open panel**, which goes to the game's panel, and **Teacher guide (PDF)**, which downloads this guide. Expanding **Versions, configurations and details** lists the rooms, each with its own **open panel** straight to that room's session-creation form. The game's panel (<https://newsvendor.beer-lab.org>) is protected: **Open panel** shows the **Admin Login** screen, where you type **admin** under **Username** and the password the lab gave you under **Password**. If you do not have it, request it at lab.economia@servicios.tec.mx.

Note

This game does not yet have its own card in the directory or an active panel at newsvendor.beer-lab.org: it is still being prepared. The procedure above is identical to every other lab game's (see the Cournot, Bertrand and live market guides); once it goes live, this section will be updated with screenshots specific to **Ordering under uncertain demand**.

2.2 The panel: minimal vocabulary

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

Demo	Practice sessions. Creates a session with fictitious participants that you play yourself across several tabs. Use it to rehearse, never with students.
Rooms	Fixed addresses for class. This game has four: basic and extended, in Spanish and English. Students always enter through a room.
Create / Number of participants	Create the session in the room and declare how many people will play.
Monitor	A table with each participant's round and screen. It does not show decisions.
Advance slowest participants	The Monitor button that moves along whoever has fallen behind (see section 9.2).
Report	The instructor report for projecting aggregate results.
Data	Downloads the data as CSV.
Sessions	A list of all your sessions, to return to an earlier one.
Close this room	Frees the room when done, for the next group.

In this panel, **Demo** shows only this game's ten configurations and **Rooms** only its four rooms. Inside each room, the session-creation form filters further: the basic English room ([EN] **Ordering under Uncertain Demand**) only offers the three basic English configurations (high margin, one round; high margin, 10 rounds; low margin, 10 rounds); the extended English room only offers the two extended ones (cost 3 then 9; cost 9 then 3). If a different game appears, do not start the session and notify the lab.

oTree Demo Sessions Rooms Data Server Check

Demo

[ES] Pedido con demanda incierta — margen alto (costo 3), una ronda
[ES] Pedido con demanda incierta — margen alto (costo 3), 10 rondas
[ES] Pedido con demanda incierta — margen bajo (costo 9), 10 rondas
[EN] Ordering under uncertain demand — high margin (cost 3), one round
[EN] Ordering under uncertain demand — high margin (cost 3), 10 rounds
[EN] Ordering under uncertain demand — low margin (cost 9), 10 rounds
[ES] Pedido con demanda incierta extendido — costo 3 en rondas 1–10, costo 9 en 11–20
[ES] Pedido con demanda incierta extendido — costo 9 en rondas 1–10, costo 3 en 11–20
[EN] Ordering under uncertain demand extended — cost 3 in rounds 1–10, cost 9 in 11–20
[EN] Ordering under uncertain demand extended — cost 9 in rounds 1–10, cost 3 in 11–20

Juegos de mercados / Market games — BEER Lab
 Pedido con demanda incierta / Ordering under uncertain demand

Figure 2.2: Demo: the game’s configurations (six basic and four extended, in Spanish and English).

oTree Demo Sessions Rooms Data Server Check

Rooms

Current rooms:

[ES] Pedido con demanda incierta
[EN] Ordering under Uncertain Demand
[ES] Pedido con demanda incierta — extendido
[EN] Ordering under Uncertain Demand — extended

Figure 2.3: Rooms: the game’s four rooms.

2.3 Rehearsing before class

In **Demo**, click a configuration: a practice session with three participants is created and the links page appears. Open each **P1**, **P2**, **P3** link in a separate tab and play as if you were each student; then open **Report**. Note that a round’s demand is only revealed once all three tabs have sent their order. These sessions do not affect your classes.

oTree Demo Sessions Rooms Data Server Check

[EN] Ordering under uncertain demand — high margin (cost 3), 10 rounds: session 'spjx28pp'

Edit
 Links
 Monitor
 Data
 Payments
 Report
 Description

You can either use the session-wide link, persistent links, or single-use links.

Session-wide link

If it's not practical for you to use a Room, you can distribute the following link to participants.

<http://localhost:8041/join/jerofobe>

Persistent links

For a real session, you should use a [room](#).

Single-use links

Below are single-use links.

P1	http://localhost:8041/initializeParticipant/jeiguzz9
P2	http://localhost:8041/initializeParticipant/h6ynub7f
P3	http://localhost:8041/initializeParticipant/abbj11wf
P4	http://localhost:8041/initializeParticipant/jyp07ila
P5	http://localhost:8041/initializeParticipant/slpts7p
P6	http://localhost:8041/initializeParticipant/363k4x8r
P7	http://localhost:8041/initializeParticipant/sztshcfe
P8	http://localhost:8041/initializeParticipant/7js20wdg
P9	http://localhost:8041/initializeParticipant/zz23882g
P10	http://localhost:8041/initializeParticipant/qdat78il
P11	http://localhost:8041/initializeParticipant/6ejxmjpa
P12	http://localhost:8041/initializeParticipant/nevy9svj
P13	http://localhost:8041/initializeParticipant/ni20xqf7
P14	http://localhost:8041/initializeParticipant/r9ruz4ue
P15	http://localhost:8041/initializeParticipant/fynjc6ca

Figure 2.4: Links for a session (here, 15 participants). This guide's screenshots were taken on a local copy, which is why the addresses say `localhost`; on the server they say `newsvendor.beer-lab.org`.

Note

Do not rehearse with the room link open in several tabs of the same browser: oTree recognizes the browser, and every tab would count as the same person. Use **Demo** to rehearse instead.

oTree Demo Sessions Rooms Data Server Check										
[EN] Ordering under uncertain demand — high margin (cost 3), 10 rounds: session 'spjx28pp'										
<a>Edit <a>Links <a>Monitor <a>Data <a>Payments <a>Report <a>Description										
ID	Code	Label	Progress	App	Round	PageName	Waiting	WaitsFor	Since	
P1	jeiguzz9		34/140	newsvendor	5	RoundResult			1m	
P2	hb9nub7f		34/140	newsvendor	5	RoundResult			1m	
P3	abbj11wf		34/140	newsvendor	5	RoundResult			1m	
P4	jyp07ila		34/140	newsvendor	5	RoundResult			1m	
P5	slpots7p		34/140	newsvendor	5	RoundResult			1m	
P6	363k4x0r		34/140	newsvendor	5	RoundResult			1m	
P7	szshcfe		34/140	newsvendor	5	RoundResult			1m	
P8	7js20wdg		34/140	newsvendor	5	RoundResult			1m	
P9	zz23882g		34/140	newsvendor	5	RoundResult			1m	
P10	qdat78il		34/140	newsvendor	5	RoundResult			1m	

Figure 2.5: Monitor of a session in progress: each participant's round and screen.

2.4 Creating the session in class

Under **Rooms**, open the room for the language you will use. The form offers only that room's configurations. Choose the configuration, type the number of students present under **Number of participants** and click **Create**.

oTree Demo Sessions Rooms Data Server Check										
Room: [EN] Ordering under Uncertain Demand Create a new session English room. Only the configurations of this game, language and edition are shown below. Session Config [EN] Ordering under uncertain demand — high margin (cost 3), one round ▼ Number of participants Must be a multiple of 1 Create Configure session ⚙️ App sequence										

Figure 2.6: Form for the basic English room: only its own three configurations appear.

Note

Declare the exact number, with no spare seats. Each round's demand is revealed only once *every* declared participant has ordered. If you declare more people than actually join, the first round never ends. If one more student than declared arrives, they will see a “session is full” message (currently shown in Spanish, “La sesión está llena”, on English rooms too); in that case, before starting, click **Close this room**, create another session with the correct number, and ask the class to reopen the link or the QR code.

2.5 How your students join

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

1. **QR code.** Project the one for the room you are using (below, and full-size in appendix A). They scan it with a phone camera.
2. **Room link.** Share it over the class chat or on Canvas: https://newsvendor.beer-lab.org/room/newsvendor_en.
3. **Catalogue.** At teaching.beer-lab.org they search for **Ordering under uncertain demand** and click their language's button (once the game is live).



English, basic

newsvendor.beer-lab.org/room/newsvendor_en



English, extended

newsvendor.beer-lab.org/room/newsvendor_extended



Español, básica

newsvendor.beer-lab.org/room/newsvendor_es



Español, extendida

newsvendor.beer-lab.org/room/newsvendor_extendido

What the participant sees

The student opens the room and clicks **Start**. If you have not created the session yet, they see a waiting page and join as soon as you do; so you can share the link or QR code from the start of class. No email or password is needed: they receive an anonymous code.

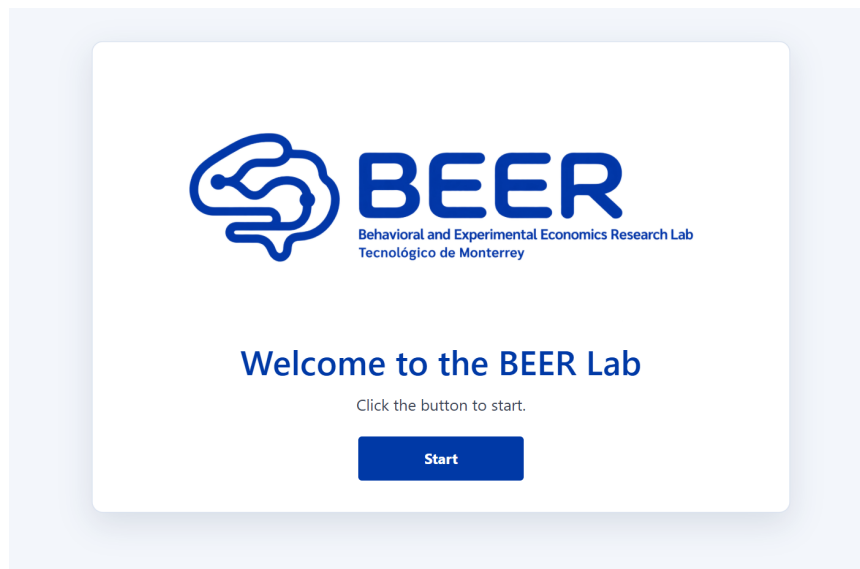


Figure 2.7: Room the student opens.

Language is set per room: a session created in the English room only admits students entering through the English room. If your group is mixed, pick one language for everyone.

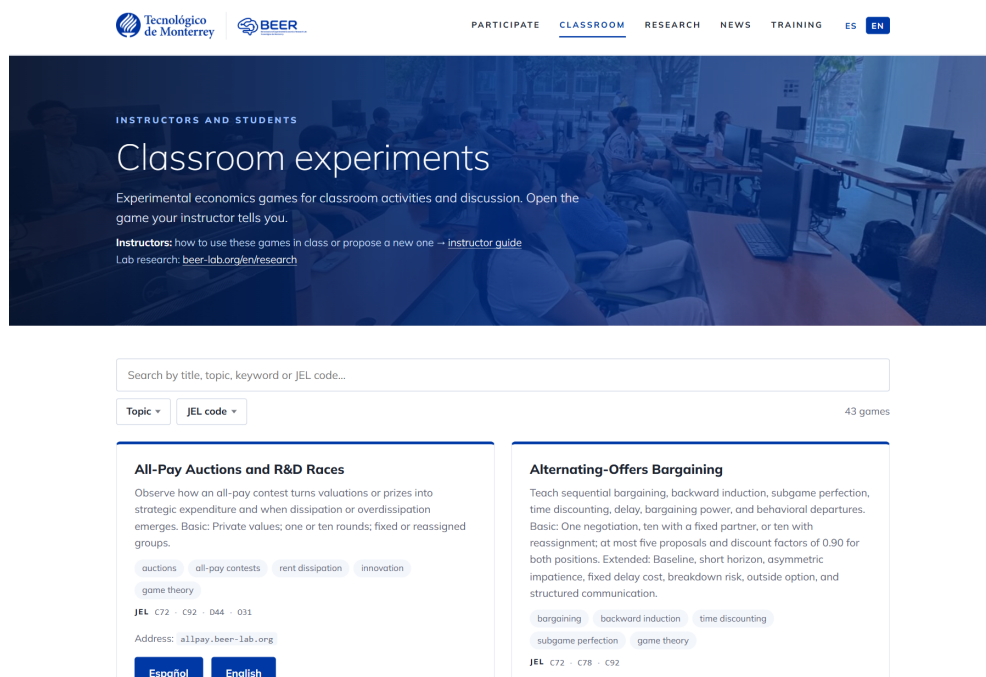


Figure 2.8: Catalogue at teaching.beer-lab.org, the students' page. Once this game goes live, its card will appear here (search for **Ordering under uncertain demand**).

The basic game and its screens

3.1 Rules, incentives and benchmarks

Each participant runs a store and decides individually, without interacting with anyone. Each round they order Q units, a whole number between 0 and 300, at a unit cost c paid on everything ordered. Then demand D is revealed: a whole number between 1 and 300, all values equally likely. They sell $\min(Q, D)$ units at the price $p = 12$; unsold units are worth nothing and do not carry over to the next round.

$$\pi(Q, D) = 12 \cdot \min(Q, D) - c \cdot Q \quad (\text{can be negative})$$

In the basic configurations the cost is fixed for the whole session: $c = 3$ (**high margin**: each unit sold earns 9) or $c = 9$ (**low margin**: each unit sold earns 3). The benchmarks that only you see in the report are:

	High margin ($c = 3$)	Low margin ($c = 9$)
Critical fractile $(p - c)/p$	0.75	0.25
Optimal order (risk neutral)	225 and 226 (tie)	75 and 76 (tie)
Expected profit of the optimum	1017	114
Expected profit of ordering 150	903	3

Mean demand is 150.5. Theory predicts orders well above it with a high margin and well below it with a low margin; the evidence (section 5.2) is that they get stuck between the optimum and mean demand.

Common demand and synchronized reveal. In each round demand is the same for every store in the class (so the report's table by round can be discussed together). So that nobody sees demand before their neighbours, it is revealed only once the whole class has sent its orders. The instructions say so. In practice the class moves at the pace of its slowest member (section 9.2).

Class size. Each person is their own group: the game works the same with 1, 2, an odd number or 35 participants. There are no incomplete pairs or leftover people.

For the instructor

Before playing, ask the class: if demand can be any number between 1 and 300, how many units would you order? Many answers hover around 150, "what you expect to sell". The game shows that the right answer depends on the margin: at cost 3 it pays to order much more; at cost 9, much less.

3.2 Cover, instructions and comprehension check

The cover page introduces the BEER Lab and its rules of conduct. The instructions describe only the action and the payment rule: cost, price, demand range, the steps of a round, the earnings formula and a numerical example. They never say “newsvendor”, “optimal”, “critical fractile”, “bias” or “mean demand”, show no expected profit or calculator, and do not suggest any order.





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 an activity in which you decide how many units of a product to order for your store. Your earnings depend on your decisions and partly on chance.

During the session

- Do not talk or communicate with other people.
- 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

Round 1 of 10

You run a store. In each round you decide how many units of a product to order **before** you know how many units your customers will want to buy.

Each unit you order costs you **3 ECU**, whether you sell it or not.

Each unit you sell pays you **12 ECU**. The price does not change during the activity.

Demand (how many units your customers want to buy) is a whole number between 1 and 300; every number is equally likely. It is drawn again in every round and is the same for every store in the class.

How each round is decided

1. You order a whole number of units between 0 and 300.
2. Once everyone has placed their order, demand is revealed.
3. You sell the smaller of your order and the demand. Units you do not sell are worth nothing and do not carry over to the next round.

Your earnings = $12 \times \text{units sold} - \text{cost per unit} \times \text{units ordered}$. They can be negative.

Example: if you order 200 units and demand is 120, you sell 120 and 80 are left over. Your earnings are $12 \times 120 - 3 \times 200 = 1440 - 600 = 840$ ECU.

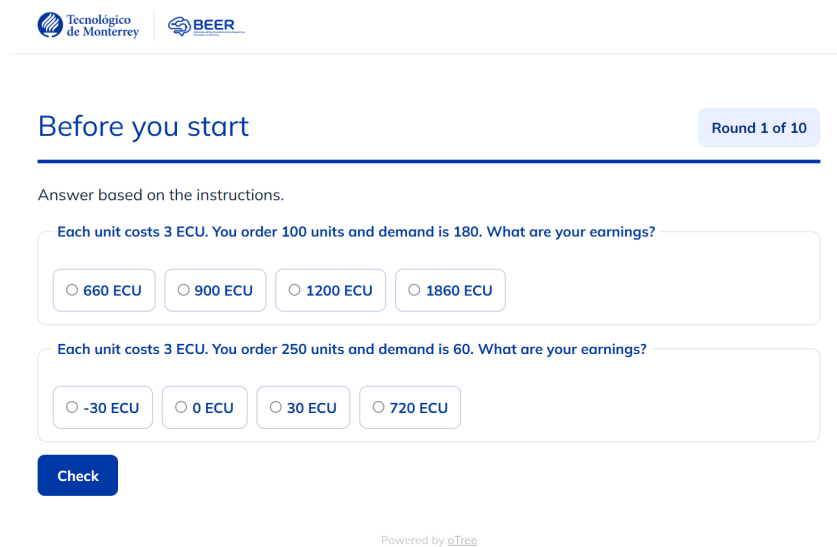
- There will be 10 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

Continue

Powered by [oTree](#)

Figure 3.2: Instructions with a high margin (cost 3): rules, steps of a round, earnings and example.

The example uses an order of 200 and a demand of 120: 120 are sold, 80 are left over and earnings are $12 \times 120 - 3 \times 200 = 840$ ECU (-360 at cost 9). The check asks two questions with different numbers: order 100 and demand 180 (earnings 900 at cost 3) and order 250 and demand 60 (earnings -30 at cost 3). The wrong options match typical mistakes: forgetting the cost, selling the demand instead of the order, paying only for what is sold, or getting the sign wrong. After a mistake, the message restates the rule without giving the answer and lets the participant try again. No number in the instructions or the questions is 75–76, 150–151 or 225–226, or points to them.



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Before you start

Round 1 of 10

Answer based on the instructions.

Each unit costs 3 ECU. You order 100 units and demand is 180. What are your earnings?

☐ 660 ECU ☐ 900 ECU ☐ 1200 ECU ☐ 1860 ECU

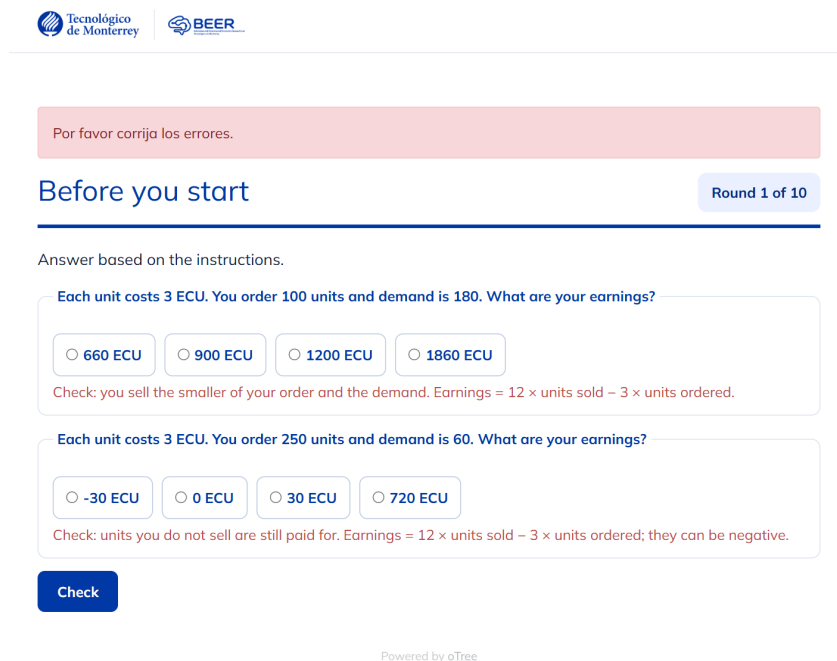
Each unit costs 3 ECU. You order 250 units and demand is 60. What are your earnings?

☐ -30 ECU ☐ 0 ECU ☐ 30 ECU ☐ 720 ECU

Check

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Figure 3.3: Comprehension check (cost 3).



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Por favor corrija los errores.

Before you start

Round 1 of 10

Answer based on the instructions.

Each unit costs 3 ECU. You order 100 units and demand is 180. What are your earnings?

☐ 660 ECU ☐ 900 ECU ☐ 1200 ECU ☐ 1860 ECU

Check: you sell the smaller of your order and the demand. Earnings = $12 \times \text{units sold} - 3 \times \text{units ordered}$.

Each unit costs 3 ECU. You order 250 units and demand is 60. What are your earnings?

☐ -30 ECU ☐ 0 ECU ☐ 30 ECU ☐ 720 ECU

Check: units you do not sell are still paid for. Earnings = $12 \times \text{units sold} - 3 \times \text{units ordered}$; they can be negative.

Check

Powered by oTree

Figure 3.4: Wrong answers: each message restates the rule without giving the answer. The selected options are cleared and must be ticked again.

3.3 Order and waiting

The order screen recalls the cost per unit, the price and the demand range. The participant types a whole number between 0 and 300 and clicks **Send order**. The browser does not accept numbers outside that range or decimals.

Your order

Round 1 of 10

Cost per unit ordered
3 ECU

Price per unit sold
12 ECU

Possible demand
1 to 300

Units you order (whole number between 0 and 300)

181

Send order

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Figure 3.5: Order screen, first round (simulated decisions).

From the second round on, the table **Your previous rounds** appears below: order, demand, units sold and earnings for each round, with losses in red. This table is the only feedback: there is no calculator and no expected profit.

Your order

Round 6 of 10

Cost per unit ordered
3 ECU

Price per unit sold
12 ECU

Possible demand
1 to 300

Units you order (whole number between 0 and 300)

176

Send order

Your previous rounds

Round	Order	Demand	Sold	Earnings
1	181	83	83	453
2	163	146	146	1263
3	160	197	160	1440
4	172	267	172	1548
5	198	68	68	222

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Figure 3.6: Order screen in round 6, with the participant's own history (simulated decisions).

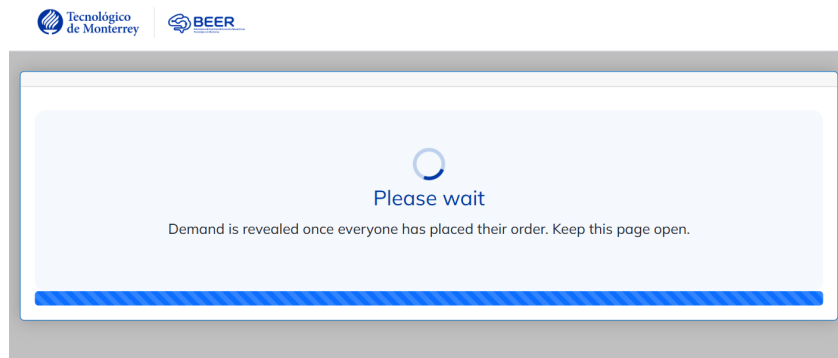


Figure 3.7: Waiting while other people's orders are pending.

What the participant sees

“Please wait” means other people's orders are still pending: demand is revealed once the whole class has ordered. It is not an error. The participant should not close or refresh the page.

3.4 Result and wrap-up

The result shows the order, the demand, the units sold and unsold, and the round's and cumulative earnings. Negative earnings appear in red.

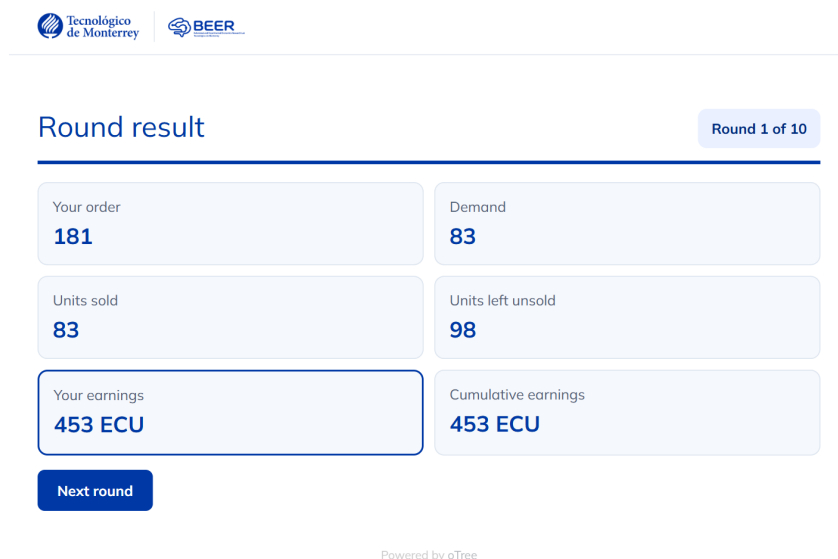


Figure 3.8: Result of the first round (simulated decisions).

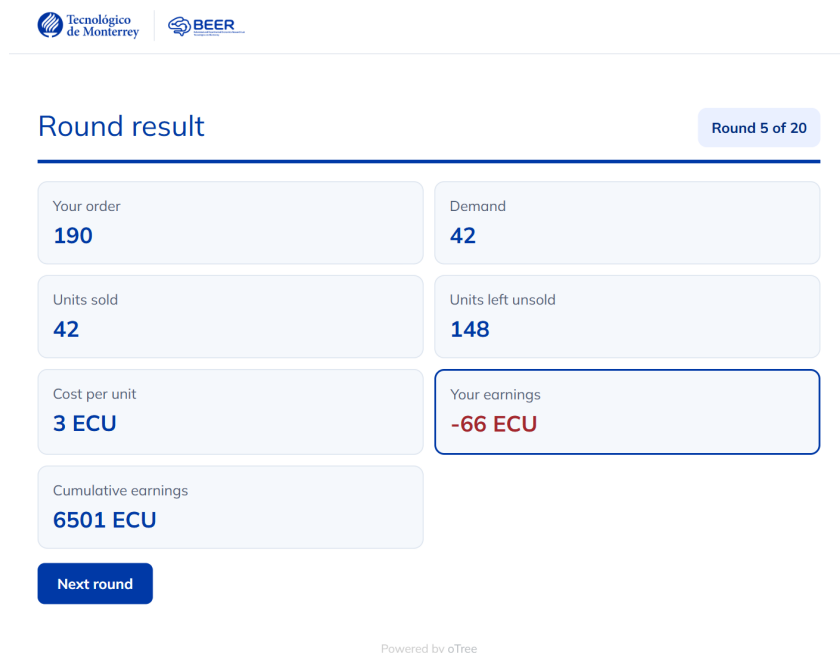


Figure 3.9: A round with very low demand: many units are left over and earnings are negative (simulated decisions; from the extended session, which also shows the cost per unit).



Figure 3.10: Wrap-up: total earnings, round history and a note to wait for the instructor (simulated decisions).

Instructor report and debrief

4.1 When to reveal

Report is a tab on the session page: reach it from the room with **Monitor the session**, or from **Sessions** if the session has ended. It opens with results hidden. At the top it shows participants, price, cost (“3 → 9” if it changes) and completed rounds, so you can project it from the start without giving anything away. Click **Show results** when the current round ends; **Refresh** adds new rounds and **Hide results** covers them again.

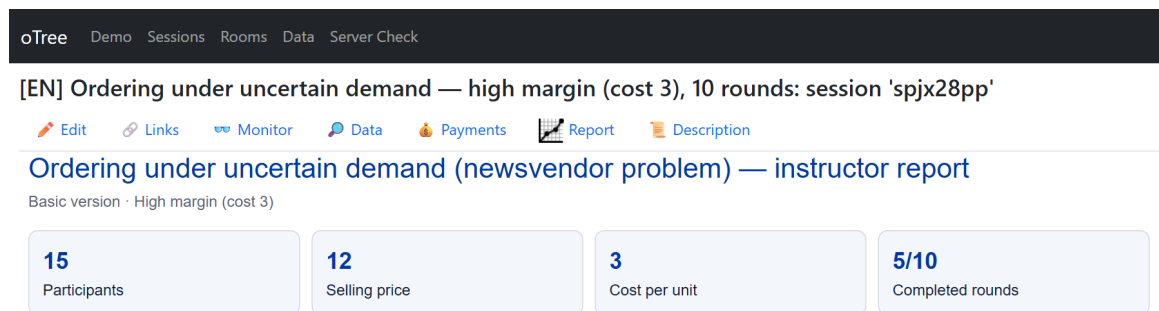


Figure 4.1: Report with results hidden.

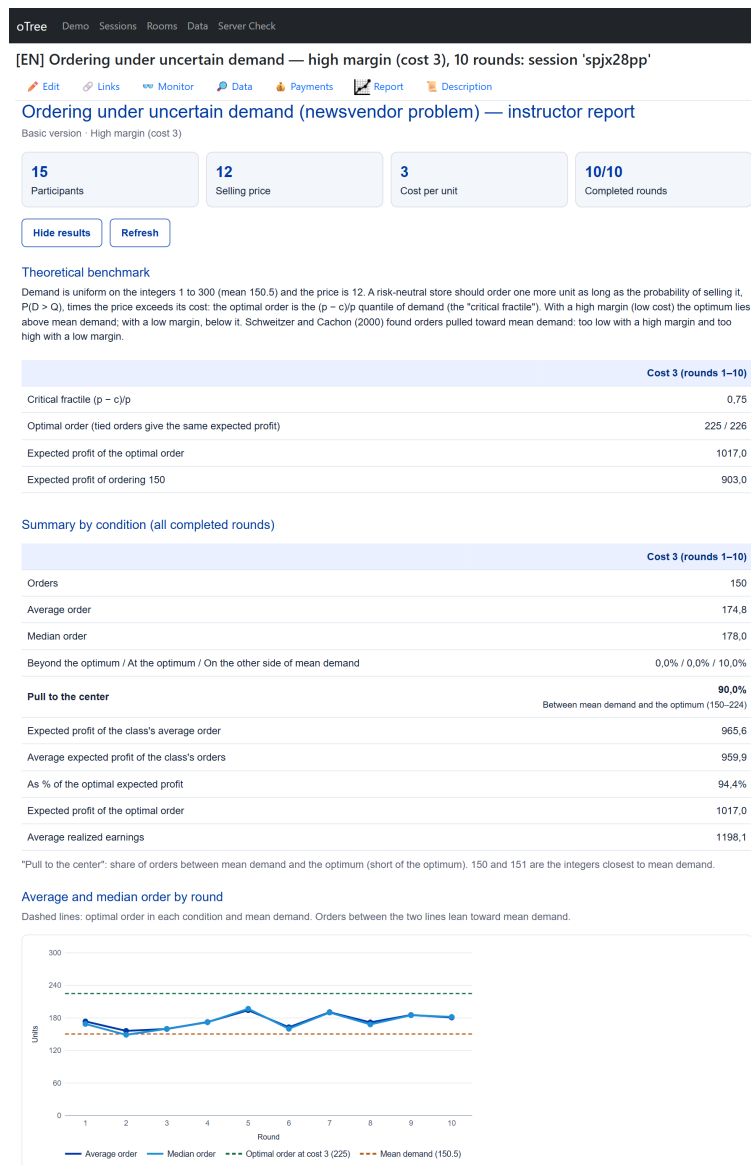


Figure 4.2: Report revealed: theoretical benchmark, summary and round-by-round chart (15 participants, 10 rounds with a high margin, simulated decisions).

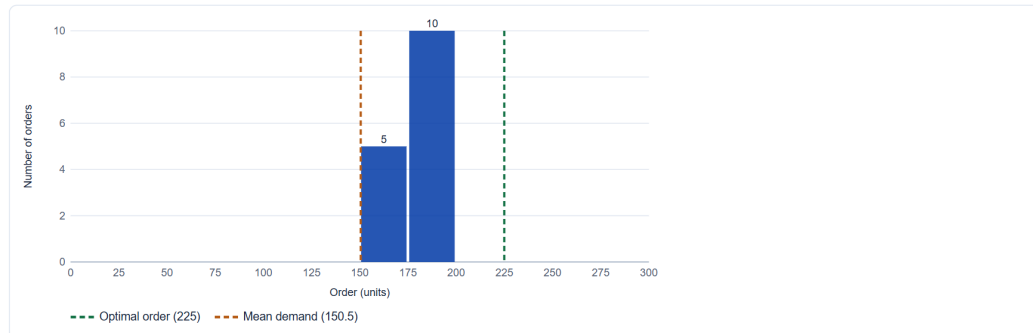
First and last round of each condition

	Average order	Median order	% between mean and optimum	Average earnings
Cost 3 (rounds 1–10) · Round 1	173,6	169	93,3%	475,2
Cost 3 (rounds 1–10) · Round 10	180,8	182	100,0%	1583,2

Distribution of orders

Cost 3 (rounds 1–10)

Orders in round 10 (last completed round of this condition).



Results by round

Round	Cost	Demand	Orders	Average order	Median order	% between mean and optimum	Average earnings
1	3	83	15	173,6	169	93,3%	475,2
2	3	146	15	156,3	149	46,7%	1260
3	3	197	15	159,7	160	66,7%	1437,6
4	3	267	15	172,5	172	100,0%	1552,8
5	3	68	15	194,3	197	100,0%	233,2
6	3	281	15	162,9	160	93,3%	1465,8
7	3	117	15	190,7	190	100,0%	832
8	3	233	15	171,9	168	100,0%	1546,8
9	3	180	15	185,5	185	100,0%	1594,6
10	3	181	15	180,8	182	100,0%	1583,2

Individual data: Data → Custom export (newsvendor). Design: Schweitzer and Cachon (2000); classroom version by Holt (Veconlab, "Supply Chain", newsvendor option).

Figure 4.3: Report revealed: first and last round, histogram of last-round orders and table by round (simulated decisions).

4.2 How to read the report

1. The **theoretical benchmark** explains the critical-fractile rule and gives, for each cost condition, the critical fractile, the optimal order (the two tied integers), its expected profit and that of ordering 150.
2. The **summary by condition** gathers the number of orders, the average and median order, and a classification of every order: beyond the optimum, at the optimum, on the other side of mean demand and, in bold, the **pull to the center**: the share of orders between mean demand and the optimum, short of it (150–224 at cost 3; 77–151 at cost 9). The four categories add up to 100%.
3. The **expected profit** rows measure decision quality without the noise of demand: the expected profit of the class's average order, the average of the expected profits of each order, and the latter as a percentage of the optimum. **Realized earnings** also depend on the demands drawn,

so they can be high or low by luck.

4. The **round-by-round chart** plots the average and median order with dashed lines at the optimum and at mean demand. If the class's lines sit between the two references, there is pull to the center. In the 20-round configurations, a vertical line marks the cost change.
5. **First and last round** compares the start and end of each condition; the **histogram** shows the orders of the last round of each condition; the **table by round** gives each round's demand next to the average order, which lets you see whether orders "chase" the previous round's demand.

Note

The English report currently prints decimals with a comma (174,8) and some values without decimals or with a point in the chart legends (150.5), because the server's base language is Spanish. Read "174,8" as 174.8.

For the instructor

In the simulated session in the figures (15 participants, 10 rounds, cost 3; *scripted* decisions for illustration, not class results), the average order was 174.8 (median 178), 90% of orders fell between mean demand and the optimum, 10% below 150 and none at or beyond the optimum. Even so, the average expected profit of the orders was 959.9, 94.4% of the optimum: with a high margin, falling short costs little. Average realized earnings were 1198.1, *above* the optimum's expected profit (1017), simply because several rounds drew high demand — a good example of why realized earnings should not be used to judge decisions. The script gave each person an "anchor" order between 150 and 200, moved it each round a fraction toward the demand just seen (up after high demand, down after low demand) and pulled it partly back toward the anchor; the game drew the demands. Your class's numbers will differ.

Debrief script

Ask first: how many units did you order in the last round, and why? Many answers will mention "what I expect to sell" or the previous round's demand. Project the chart: orders sit between 150 and 225. Then do the marginal calculation from section 5.1: unit number $Q + 1$ is sold with probability $(300 - Q)/300$ and earns 12; it always costs 3. It pays to order it as long as $12 \times (300 - Q)/300 > 3$, that is, up to $Q = 225$. Close with the key sentence: *what matters is not how much I expect to sell, but what running short costs me compared with what a leftover unit costs me.*

Theory and evidence

5.1 Benchmark: the critical fractile

Theoretical background

Let D be uniform on the integers $1, \dots, 300$, with price $p = 12$ and cost c . Ordering one more unit (from Q to $Q + 1$) costs c for sure and brings in p only if that unit is sold, that is, if $D > Q$:

$$E[\pi(Q + 1)] - E[\pi(Q)] = p \cdot \Pr(D > Q) - c = 12 \cdot \frac{300 - Q}{300} - c.$$

It pays to keep ordering while this is positive. The optimal order is the smallest Q with $\Pr(D \leq Q) \geq (p - c)/p$, the demand quantile given by the **critical fractile** $(p - c)/p$ (Arrow et al., 1951).

- $c = 3$: critical fractile 0.75. The increment is exactly 0 at $Q = 225$, so 225 and 226 give the same expected profit (1017).
- $c = 9$: critical fractile 0.25; 75 and 76 tie (expected profit 114).

In general, the critical fractile weighs the cost of running short (the lost margin, $p - c$) against the cost of a leftover unit (c): $(p - c)/[(p - c) + c]$.

The exact expected profit is $E[\pi(Q)] = \frac{12}{300} \sum_{d=1}^{300} \min(Q, d) - cQ$, and the report also uses it for a non-integer Q (the class's average order). For Q between 0 and 300 it can be written as $E[\pi(Q)] = 12Q - \frac{12Q(Q-1)}{600} - cQ$, a parabola. Two consequences useful for discussion:

Loss from straying from the optimum. Since the curve is a parabola, the expected loss grows with the square of the distance to the optimum and is the same in both conditions for the same distance: ordering 150 costs between 111 and 114 ECU of expected profit both at cost 3 (1017 versus 903) and at cost 9 (114 versus 3). In relative terms, however, it is very different: with a high margin about 11% is lost; with a low margin almost all of the expected profit is lost. That is why the same deviation is “felt” little with a high margin and a lot with a low margin.

Average of orders versus average of profits. Since expected profit is concave, the average expected profit of the class's orders is always at most the expected profit of the average order. The report shows both: the gap measures what the dispersion of orders across people and rounds costs.

Risk. The rule above is for a risk-neutral decision maker. Risk aversion leads to ordering less in *both* conditions (ordering less reduces the variability of earnings), so it can explain low orders with a high margin but not orders that are *too high* with a low margin. That asymmetry is what makes the pull-to-center pattern interesting (Schweitzer and Cachon, 2000).

5.2 Experimental evidence

Schweitzer and Cachon (2000) introduce the high-margin/low-margin design with a known uniform demand and find that orders lean toward mean demand: below the optimum with a high margin and above it with a low margin. They discuss several behavioral explanations, among them anchoring on mean demand (or on the previous order) with insufficient adjustment, and a preference for reducing the after-the-fact gap between what was ordered and what was demanded; they show that risk aversion and loss aversion do not explain the pattern in both conditions.

Benzion et al. (2008) run another experiment on the same problem and also find orders between the optimum and mean demand.

Bolton and Katok (2008) study the role of experience and feedback: over many rounds orders improve, but slowly, and the bias does not disappear.

Bostian et al. (2008) is Holt's experiment with this game. It documents the pull to the center and explains it with an adaptive learning model in which decisions respond to recent experience, which also produces adjustments in the direction of earlier rounds' demand.

The classroom version this game follows is Holt (2019)'s, with its Veconlab "Supply Chain" program (newsvendor option, <https://veconlab.com>): a fixed price, a known uniform demand, and one high and one low cost.

5.3 Regularities worth discussing

- Orders fall between mean demand and the optimum: too low with a high margin, too high with a low margin. Very few people choose the optimum.
- Orders respond to the previous round's demand: they rise after a round in which stock ran out and fall after one with leftovers, even though demands in different rounds are independent.
- With a high margin the loss in expected profit is small; with a low margin the same deviation can push expected profit close to zero.
- With experience, orders move toward the optimum, but slowly. Check this in the first/last-round table of your own session, without expecting a large change.

Note

Results from one class are descriptive. With ten rounds, decisions by the same person are not independent observations, and since every store faces the same demand in each round, a run of high or low demands moves the whole class at once. In the extended version, the comparison between conditions mixes the effect of the cost with accumulated experience and order.

Basic modes

The three basic modes live in the same room (the basic room, in each language); the panel only allows one active session per room at a time.

6.1 High margin, one round

`newsvendor_en_high_margin_1_round`: a single round at cost 3, with no round counter or cumulative earnings. Useful as a short demonstration or to collect “first-instinct” orders before explaining the model.

6.2 High margin, 10 rounds

`newsvendor_en_high_margin_10_rounds`: the configuration described in Chapter 3. The optimum (225–226) lies above mean demand; the expected bias is under-ordering.

6.3 Low margin, 10 rounds

`newsvendor_en_low_margin_10_rounds`: the same, at cost 9. The optimum (75–76) lies below mean demand; the expected bias is over-ordering. The instructions and questions use the same orders and demands, computed at cost 9: the example gives -360 and the correct answers are 300 and -1530 .

Instructions

Round 1 of 10

You run a store. In each round you decide how many units of a product to order **before** you know how many units your customers will want to buy.

Each unit you order costs you **9 ECU**, whether you sell it or not.

Each unit you sell pays you **12 ECU**. The price does not change during the activity.

Demand (how many units your customers want to buy) is a whole number between 1 and 300; every number is equally likely. It is drawn again in every round and is the same for every store in the class.

How each round is decided

1. You order a whole number of units between 0 and 300.
2. Once everyone has placed their order, demand is revealed.
3. You sell the smaller of your order and the demand. Units you do not sell are worth nothing and do not carry over to the next round.

Your **earnings** = $12 \times \text{units sold} - \text{cost per unit} \times \text{units ordered}$. They can be negative.

Example: if you order 200 units and demand is 120, you sell 120 and 80 are left over. Your earnings are $12 \times 120 - 9 \times 200 = 1440 - 1800 = -360$ ECU.

- There will be 10 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

Continue

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Figure 6.1: Instructions with a low margin (cost 9).

Before you start

Round 1 of 10

Answer based on the instructions.

Each unit costs 9 ECU. You order 100 units and demand is 180. What are your earnings?

- ☐ -420 ECU
 ☐ 300 ECU
 ☐ 1200 ECU
 ☐ 1260 ECU

Each unit costs 9 ECU. You order 250 units and demand is 60. What are your earnings?

- ☐ -1530 ECU
 ☐ 0 ECU
 ☐ 720 ECU
 ☐ 1530 ECU

Check

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Figure 6.2: Comprehension check at cost 9.

For the instructor

If you teach two groups, use a high margin in one and a low margin in the other, and compare the reports in the next class: with the same demand, the two groups' orders usually end up much closer to each other than theory predicts (225 versus 75).

Extended variants

Variant	What changes	What it is for
Cost 3 then 9	20 rounds; cost 3 in rounds 1–10 and 9 in rounds 11–20.	Compare both conditions with the same people in a single session.
Cost 9 then 3	20 rounds; cost 9 in rounds 1–10 and 3 in rounds 11–20.	The reverse order, for another group or to separate the effect of order.

Both live in the extended room (**[EN] Ordering under Uncertain Demand — extended**). Price and demand do not change.

7.1 Cost change in round 11

`newsvendor_extended_high_then_low` and `newsvendor_extended_low_then_high`. The instructions announce from the start that the cost changes in round 11 and work the example at both costs; the comprehension check uses the cost of rounds 1–10. In round 11 the order screen shows a notice. In these configurations the history includes a column with each round's cost and the result shows the cost per unit.

Instructions

Round 1 of 20

You run a store. In each round you decide how many units of a product to order **before** you know how many units your customers will want to buy.

In rounds 1 to 10, each unit you order costs you **3 ECU**, whether you sell it or not. From round 11 on, each unit costs **9 ECU**. You will be told on screen when it changes.

Each unit you sell pays you **12 ECU**. The price does not change during the activity.

Demand (how many units your customers want to buy) is a whole number between 1 and 300; every number is equally likely. It is drawn again in every round and is the same for every store in the class.

How each round is decided

1. You order a whole number of units between 0 and 300.
2. Once everyone has placed their order, demand is revealed.
3. You sell the smaller of your order and the demand. Units you do not sell are worth nothing and do not carry over to the next round.

Your earnings = $12 \times \text{units sold} - \text{cost per unit} \times \text{units ordered}$. They can be negative.

Example: if you order 200 units and demand is 120, you sell 120 and 80 are left over. Your earnings are $12 \times 120 - 3 \times 200 = 1440 - 600 = 840$ ECU. At a cost of 9 ECU per unit, the same case would give $12 \times 120 - 9 \times 200 = 1440 - 1800 = -360$ ECU.

- There will be 20 rounds. Your earnings from all rounds are added up.
- Amounts are in ECU (experimental currency units). There is no cash payment.

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Figure 7.1: Instructions for the extended version (cost 3 then 9).

Your order

Round 11 of 20

From this round on, each unit you order costs 9 ECU. The price does not change.

Cost per unit ordered
9 ECU

Price per unit sold
12 ECU

Possible demand
1 to 300

Units you order (whole number between 0 and 300)

Send order

Your previous rounds

Round	Cost	Order	Demand	Sold	Earnings
1	3	189	189	189	1701
2	3	183	182	182	1635
3	3	182	202	182	1638
4	3	189	180	180	1593
5	3	190	42	42	-66
6	3	158	75	75	426
7	3	143	123	123	1047
8	3	158	44	44	54
9	3	138	233	138	1242
10	3	174	260	174	1566

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Figure 7.2: Round 11: notice of the cost change and history with the cost column (simulated decisions).

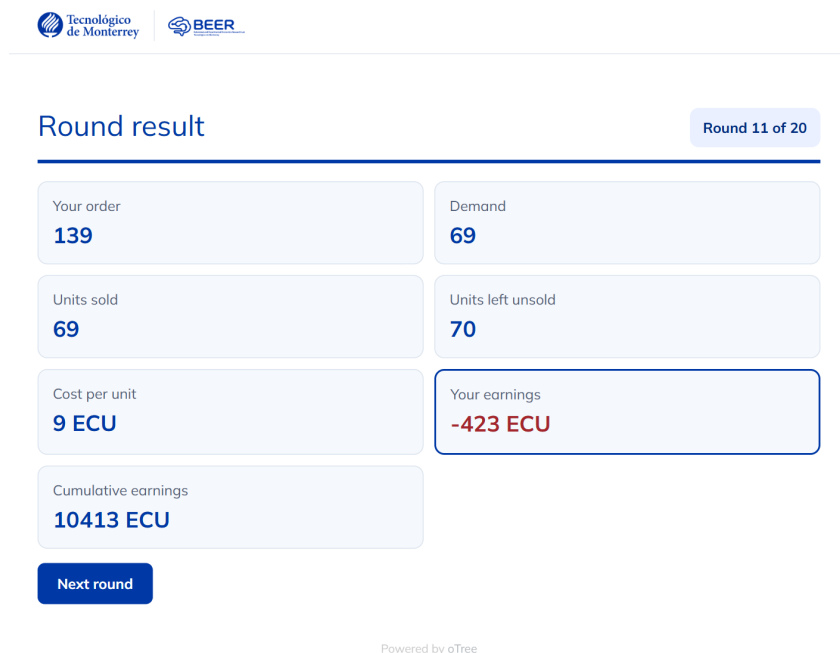


Figure 7.3: Result of round 11 at the new cost (simulated decisions).

The report presents both conditions side by side, each with its own optimum, and the round-by-round chart marks the change with a vertical line.



Figure 7.4: Report of an extended session (15 participants, cost 3 then 9): both conditions side by side and the chart with the cost change (simulated decisions).

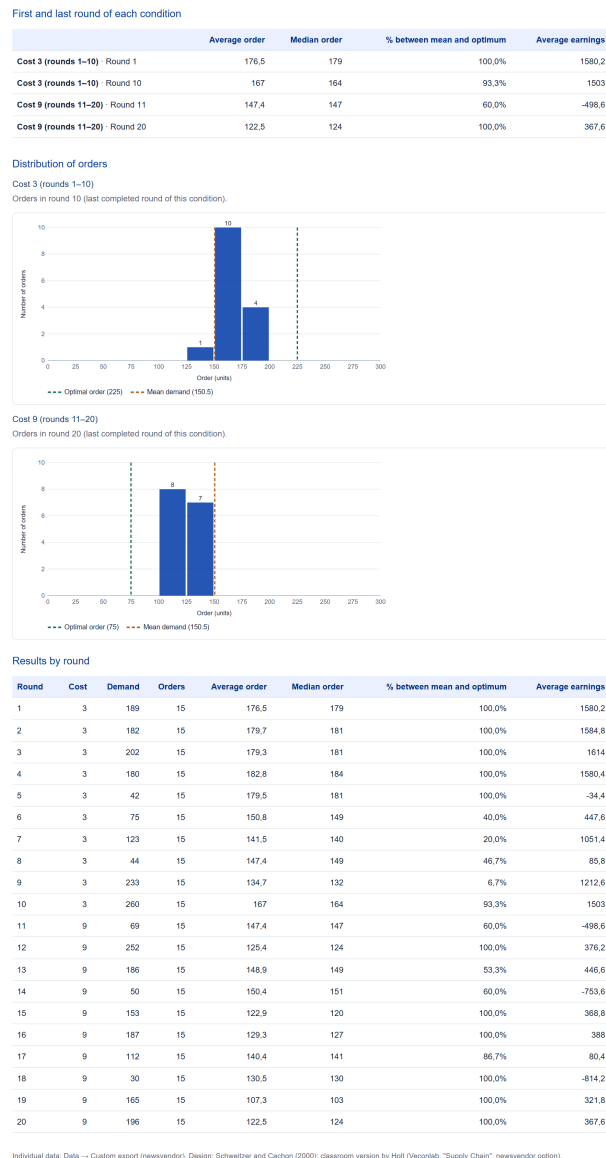


Figure 7.5: Report of the extended session: first and last round of each condition, one histogram per condition and table by round (simulated decisions).

For the instructor

In the simulated extended session (*scripted* decisions), the average order was 163.9 at cost 3 and 132.5 at cost 9: it fell, but far less than the distance between the optima (225 and 75). At cost 9, 86% of orders fell between the optimum and mean demand, and the average expected profit of the orders was 38.2% of the optimum (versus 91.7% at cost 3). The script started round 11 at 15 to 35 units above a personal anchor between 100 and 140 and followed the same adjustment rule as in the basic session.

Debrief script

Project the chart with the cost-change line and ask: when the cost went from 3 to 9, how much did your order change? How much should it have changed? Show the two “Average expected profit of the class’s orders” figures: the same distance from the center costs little with a high margin and almost all the profit with a low margin.

Class plan and reading the results

8.1 Suggested 50-minute session

0–5 min	Create the session (room [EN] Ordering under Uncertain Demand — extended , configuration <code>newsvendor_extended_high_then_low</code>). Students join by QR code or link.
5–10 min	Cover page, instructions and comprehension check. Optionally, first ask for a “paper” order at each cost.
10–30 min	20 order rounds (about a minute per round; the slowest person sets the pace). Follow progress on the Monitor.
30–35 min	Open the hidden report; ask for predictions: was the average order above or below 150 at each cost?
35–45 min	Reveal results. Show the summary by condition, the chart with the cost change and the table by round (did orders follow the previous demand?). Discuss.
45–50 min	Wrap-up: derive the critical fractile with the marginal calculation and compare the loss in expected profit in each condition.

If you have less time, use `newsvendor_en_high_margin_10_rounds` (about 15 minutes of play) and ask at the end what people would have ordered at cost 9.

8.2 Discussion questions

- Why is it not a good idea simply to order what you expect to sell (150)?
- What does it cost you to be one unit short? And to have one unit left over? How do those two amounts change when the cost goes from 3 to 9?
- After a round in which you ran out, did you order more? Did that make sense, if each round’s demand is independent of the previous one?
- Why is risk aversion not enough to explain ordering too much at cost 9?
- Where does this problem appear outside the classroom? Newspapers and perishable food, seasonal fashion, airline and hotel overbooking, vaccine inventories, temporary staffing.
- What information or tool (a table of expected profits, a calculator, more rounds) do you think would help people order better?

8.3 Common misinterpretations

Mistake	Clarification
“The safest, most sensible order is mean demand.”	The optimal order depends on the margin: 225 at cost 3 and 75 at cost 9. Ordering 150 is optimal only when the margin is half the price.
“Demand was high last round, so now I should order more.”	Demands in different rounds are independent: the last round says nothing about the next. Chasing it only adds variability.
“Whoever earned the most in the session decided best.”	Realized earnings depend on the demands drawn. To judge decisions, use the expected profit of the orders (report rows).
“Ordering little with a high margin is risk aversion.”	It may contribute, but risk aversion also predicts ordering little with a low margin, where orders are too high.
“A losing round proves I ordered badly.”	Even the optimal order loses when demand is very low (at cost 3, when demand is below 57 if you order 225).
“If the class’s average order is near the optimum, the class ordered well.”	The average can hide very dispersed orders; look at the histogram and compare the expected profit of the average order with the average expected profit of the orders.
“Falling short or overshooting costs the same in both conditions.”	In ECU the expected loss is similar for the same distance from the optimum, but with a low margin it is almost all the attainable profit.

Operation, privacy and troubleshooting

9.1 Privacy and conduct

Participant codes are anonymous: do not ask for or show names, student IDs or seats together with individual decisions. Project only aggregate results (averages, charts, histograms). Session data remain available to you under **Data**; do not share them outside the teaching or research use authorized by the lab.

9.2 If someone disconnects: Advance slowest participants

Each round waits for *the whole class* to send its orders before revealing demand: a single absent person holds everyone up. If someone disconnects, ask them to reopen the room in the same browser: they resume where they were. If they cannot, use **Advance slowest participants** on the Monitor (it advances those furthest behind, up to 20 at a time). This is what the game records in that case:

- **On the order screen**, that person's order is recorded as **0 units** and flagged as “not sent”; if they had typed a number without clicking **Send order**, that number is lost. Their earnings for the round are 0. That 0 is *not* included in the report's statistics (average order, percentages, histogram, earnings): it is excluded, and the report shows separately how many orders were not sent. The order of 0 does appear in that person's own history.
- **On the cover page, instructions or comprehension check**, advancing someone only moves them to the next screen (on the check it counts as one more attempt).
- **On the result screen**, it only moves them to the next round.

If the person does not come back, you will have to advance them every round; bear that in mind before continuing with many rounds.

9.3 Common problems

Situation	What to do
Someone sees “La sesión está llena” (session full).	You declared fewer participants than arrived. Close the room and create another session with the correct number.
The round keeps waiting.	Someone has not sent their order. Ask them to reopen the room in the same browser, or use Advance slowest participants (section 9.2).
Someone cannot send their order.	The number must be a whole number between 0 and 300; the browser flags the field otherwise.
Someone asks whether demand is the same for everyone.	Yes, in each round it is the same for the whole class; it changes from one round to the next.
Negative earnings.	They are part of the game; ECU are not converted into money.
A different game appears in Demo or Rooms.	The panel does not belong to this game. Do not start the session; notify the lab.
You need to repeat the activity with the same group.	Create a new session in the same room; the earlier session’s data stay under Sessions .

9.4 Data for later analysis

Data → **Custom export (newsvendor)** gives one row per participant and round: session, anonymous code, round, language, edition, treatment, price, unit cost, optimal order, demand, order, whether the order was not sent, units sold and unsold, earnings, expected profit of the order and comprehension-check attempts. It contains no personal identifiers.

Annotated bibliography

- [Schweitzer and Cachon \(2000\)](#): the high-margin/low-margin design and the bias toward mean demand.
- [Bolton and Katok \(2008\)](#): learning from experience and feedback is slow.
- [Bostian et al. \(2008\)](#): Holt’s experiment with this game; an adaptive learning model.
- [Benzion et al. \(2008\)](#): another experiment on the same problem.
- [Arrow et al. \(1951\)](#): the critical-fractile rule in inventory theory.
- [Holt \(2019\)](#): the classroom version and its Veconlab program (“Supply Chain”, newsvendor option).

Bibliography

- Arrow, K. J., Harris, T. and Marschak, J. (1951). Optimal inventory policy. *Econometrica*, 19(3), 250–272. [doi:10.2307/1906813](https://doi.org/10.2307/1906813). (The last page, 272, comes from secondary citations.)
- Benzion, U., Cohen, Y., Peled, R. and Shavit, T. (2008). Decision-making and the newsvendor problem: An experimental study. *Journal of the Operational Research Society*, 59(9), 1281–1287. [doi:10.1057/palgrave.jors.2602470](https://doi.org/10.1057/palgrave.jors.2602470).
- Bolton, G. E. and Katok, E. (2008). Learning by doing in the newsvendor problem: A laboratory investigation of the role of experience and feedback. *Manufacturing & Service Operations Management*, 10(3), 519–538. [doi:10.1287/msom.1060.0190](https://doi.org/10.1287/msom.1060.0190).
- Bostian, A. A., Holt, C. A. and Smith, A. M. (2008). Newsvendor “pull-to-center” effect: Adaptive learning in a laboratory experiment. *Manufacturing & Service Operations Management*, 10(4), 590–608. [doi:10.1287/msom.1080.0228](https://doi.org/10.1287/msom.1080.0228).
- Holt, C. A. (2019). *Markets, Games, and Strategic Behavior: An Introduction to Experimental Economics* (2nd ed.). Princeton University Press. No DOI. “Supply Chain” program (newsvendor option) on Veconlab: <https://veconlab.com>.
- Schweitzer, M. E. and Cachon, G. P. (2000). Decision bias in the newsvendor problem with a known demand distribution: Experimental evidence. *Management Science*, 46(3), 404–420. [doi:10.1287/mnsc.46.3.404.12070](https://doi.org/10.1287/mnsc.46.3.404.12070).

Room QR codes

Project or print the page for the room you will use. Students scan it with their phone camera and click **Start**.

Ordering under uncertain demand

English room



`newsvendor.beer-lab.org/room/newsvendor_en`

Scan the code and press **Start**.

Ordering under uncertain demand

English room, extended version



`newsvendor.beer-lab.org/room/newsvendor_extended`

Scan the code and press **Start**.

Ordering under uncertain demand

Sala en español



`newsvendor.beer-lab.org/room/newsvendor_es`

Escanee el código y pulse **Comenzar**.

Ordering under uncertain demand

Sala en español, versión extendida



`newsvendor.beer-lab.org/room/newsvendor_extendido`

Escanee el código y pulse **Comenzar**.