



Instructor's Guide to Financial Crisis and Real-Sector Transmission

Laboratory implementation, theoretical foundations,
experimental evidence, and variants

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How to use this guide

This guide prepares instructors to teach financial transmission through a two-bank economy with investors, deposit representatives, firms and an authority. It assumes no experience with classroom experiments and follows the English interface.

Begin with opening resources and the worked balance-sheet example. Then choose one institutional comparison. The report definitions distinguish choices, accounting consequences and mechanical benchmarks. The Spanish guide covers the same family and conditions.

Screenshots show real interfaces. Public routes identify the prepared product; the delivery record separates local validation from publication. Existing leverage, bank-run, money-creation and integrated-economy games remain complementary families.

Author

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

For the instructor

Trace one claim and its counterpart before interpreting a crisis. Identify the binding constraint before comparing support tools. The authority's social score is not financial wealth and must remain outside consolidation.

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A crisis through decisions and balance sheets

1.1 The question linking the activity

A fall in financial prices does not reduce production by an accounting identity. A connection must carry the shock: collateral loses value, a creditor recognizes a loss, a bank faces a constraint, and an investment cannot obtain finance. This activity makes that chain inspectable through choices and accounts. Each economy includes two banks, two investors, two deposit representatives, two firms and one authority. Nine people have different functions; they are not nine independent observations of the same economic problem.

The aim is to distinguish an initial disturbance from its propagation channels. One participant may experience a wealth loss, another a smaller credit offer and another difficulty withdrawing funds. None of these views alone describes the economy. Discussion brings the perspectives together while retaining the obligations connecting them. An asset loss has an economic counterpart; public assistance has a funding source; a debt may shrink through payment, conversion or default, but cannot disappear without a record. Following those distinctions is more useful than labeling every adverse outcome a crisis.

The activity complements the laboratory's leverage, bank-run, money-creation and integrated-economy games. It does not recreate those paradigms. It uses the existing margin and recovery component and adds an explicit link to bank capital, new finance and firm output. A published depth-and-liquidation rule replaces continuous trading here. This adaptation concentrates classroom time on transmission across accounts instead of requiring simultaneous mastery of an order book and all financial roles. It is an original teaching integration rather than a historical calibration.

By completion, students should reconstruct a bank identity, distinguish cash, solvency and capital-based lending capacity, identify voluntary and forced sales, follow public support through recovery, and explain how an offer becomes investment and output. They should also separate programmed relationships from results of choices. The liquidation price follows an announced rule; requested borrowing, reserves, sales, withdrawals, assistance and actual financing depend on people. An economy that avoids heavy borrowing is informative because it identifies conditions that keep the amplification channel from becoming active.

1.2 Family summary

Purpose	Trace liquidation, bank capital and cash, new credit, firm investment and output.
Experimental unit	Nine-person two-bank economy: two managers, two investors, two deposit representatives, two firms and one authority.
Basic edition	One episode; ten fixed-group episodes; ten episodes with role-preserving reassignment.
Extended edition	Reference and fifteen contrasts of shocks, constraints, composition, protection, support tools, exposure, output and information.
Decision	Loan offers and use, reserves, contributions, sales, withdrawals, public allocation and investment.
Payoff	Mean personal terminal wealth credited once; a separate stated social score for the authority.
Topics	financial crises; forced sales; bank capital; liquidity and solvency; credit and production; public intervention
JEL	A22; C92; E44; G01; G21; G28
Participants	Multiples of nine; minimum eighteen for reassignment.
Suggested duration	Two 75–90 minute meetings for introduction and comparison; ten episodes require multiple meetings.

1.3 Roles, resources and opening obligations

Each bank starts with 260 ECU of assets. In the reference, these are 160 cash and one security initially purchased at 100. Liabilities are 200 in deposits and owner equity is 60. The identity is $A = D + K$: 260 equals 200 plus 60. The manager controls the bank but does not receive 260 of personal cash. Final personal wealth is the old owner's residual stake after obligations and after recognizing ownership issued through public equity purchases or conversion. A management decision and a personal endowment are different objects.

Each investor has 100 ECU of personal funds. The investor can retain a reserve and borrow up to the initial bank offer, between zero and 100. Own funds not reserved and the loan purchase securities at 100 per unit. Each deposit representative controls a 200-ECU claim at the associated bank. The representative manages one aggregate balance, rather than a set of fictional depositors who should be counted as independent people. Each firm holds 20 ECU of its own and later may borrow within its bank's offer. Resources and actions differ across these roles.

The authority controls 100 ECU for public equity purchases and liquidity loans. Both tools share the same envelope: sixty allocated to one and thirty to the other leaves ten. The no-intervention condition has a zero support budget. Deposit protection adds a separate 400-ECU fund for principal top-ups, unavailable for other purposes. That fund and recoveries remain in public accounts. The authority's score is a teaching objective distinct from fiscal wealth and is excluded from consolidated financial wealth. An apparent social score gain therefore cannot close a missing monetary account.

ECU means Experimental Currency Units. It is an accounting unit without a real-money conversion. All resources reset when a new episode starts. With ten episodes, an earlier gain does not finance later choices. Mean personal outcomes are credited once at completion. Role-preserving reassignment keeps each person's function, so a manager's average does not mix manager and firm

outcomes. Role scales differ and should not be used to rank all participants publicly. Evaluate the quality of explanations separately from the level of financial outcomes.

What participants will see

Screens identify the role, its associated bank when applicable, effective resources and permitted actions. Operational headings say Financial Decisions. Crisis, amplification and policy evaluation are discussed in the guide and debrief without telling participants which behavior they are expected to display.

Resources and unit of account

The bank holds 160.00 ECU cash and 1.0 securities initially costing 100 ECU each. Initial assets total 260 ECU: 200 in deposits and 60 in owner equity. You manage the bank; 260 ECU is not personal cash.

ECU means Experimental Currency Units. No monetary conversion is specified.

Resources reset in each episode. Mean terminal wealth across your episodes is credited once at the end. The authority receives a social score, distinct from fiscal wealth.

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

This session does not convert ECU into real money.

Figure 1.1: The manager controls a bank balance sheet; assets are not personal cash.

Resources and unit of account

You manage a public budget of 100.00 ECU. Equity purchases and loans share that envelope. A separate insurance fund holds 0.00 ECU and covers only deposit principal.

ECU means Experimental Currency Units. No monetary conversion is specified.

Resources reset in each episode. Mean terminal wealth across your episodes is credited once at the end. The authority receives a social score, distinct from fiscal wealth.

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

This session does not convert ECU into real money.

Figure 1.2: Public resources distinguish discretionary support from the insurance fund.

1.4 The episode sequence

First, each manager offers financing to the investor. An offer is a limit, not automatic delivery of the entire loan. The investor chooses borrowing and retained own cash. Everyone then sees the announced scenario and a balance-sheet projection. That projection assumes no contributions or voluntary sales and only compulsory minimum withdrawal, when relevant. It is a reference for understanding resources, rather than a forecast of other people's choices. Its assumptions should be read before using any number from the table.

Investors may contribute reserves to debt repayment or sell securities. Deposit representatives request withdrawals. Those choices determine a provisional state without support: price, collateral, sales and bank accounts. The authority sees both banks and allocates resources within available instruments. The state is recalculated with intervention. Managers then observe actual capacity and choose new credit offers to firms. Firms choose how much of the offer to use and how much of their own funds to invest. A later role cannot choose a loan that an earlier role has not offered.

Finally, remaining securities and projects pay, creditors recover and claims settle by priority. Each person sees a role-specific outcome and an explicit completion screen. Waiting pages synchronize required decisions without revealing individual choices. People who do not decide at a stage wait neutrally. Verbal bargaining is unnecessary and laboratory rules preserve privacy and silence. Avoid announcing one group's results while another group is still making the corresponding decisions; that would change the information environment.

The overall plan proposes a longer staged case over two classes. This adaptation organizes it into decision and accounting stages inside an episode, with two banks and nine human roles. It does not reproduce a historical crisis or calibrate 2008. Ten-episode modes can support practice distributed across meetings; they are not promised to fit into a short class. For first use, one well-discussed interaction and one carefully chosen institutional comparison are more manageable than a long sequence without interpretation.

Accounting, liquidation and credit transmission

2.1 Margin and the common liquidation price

Initial margin is fifty percent. An investor who uses 100 of own funds and borrows 100 buys two securities. Own equity covers half the cost. Retaining all 100 while also borrowing 100 fails initial margin because the position would be entirely debt financed. A reserve remains outside the position and can later be contributed subject to the rules. It is not automatically pledged as general collateral. That distinction lets students compare a cash contribution with a sale instead of assuming every available balance has already been transferred to the lender.

Reference securities pay sixty at maturity. Sale price begins at that value and declines one ECU per unit sold across investors and banks, with a floor of twenty. Starting from the same choices, the program computes liquidations at a candidate price and lowers price if the resulting sales imply a further decline. It never raises price within that process. Repetition stops when no additional cent decline occurs. Security quantities are recorded in hundredths of a unit, making the rule finite and reproducible.

This is a classroom depth mechanism, not a competitive auction or an estimated market-impact coefficient. Both banks share the price, so sales in one part of the economy can affect the other's balance sheet. Computational iterations are not decision rounds or independent observations. The report plots them as steps of the same liquidation and marks the security's maturity payoff separately. Students should distinguish a mechanical adjustment trace from a time series of new information or choices.

Reference maintenance margin is twenty-five percent. Contributions and voluntary sales repay debt before the automatic sale is assessed. If the condition remains violated, the program finds the smallest 0.01-unit sale restoring it, or liquidates the whole position if restoration is impossible. Sale proceeds repay debt first and any excess returns to reserves. The margin and recovery calculation is the same component used in the individual leverage activity, now receiving the common price determined by this integration. Reuse keeps contract accounting comparable while adding the systemic connection.

Unsold securities pay the fundamental at maturity. An external intermediary buys liquidated units at the sale price and receives their later payment, so the discount has an accounting counterpart. Before maturity, an outstanding loan is marked at the smaller of its debt and collateral value at the stress price. That marked value is not silently converted to available cash. A later recovery can improve closing accounts without having been available for new firm lending earlier. This timing difference is central to the distinction between wealth and current funding.

Theoretical foundation

A collateral decline can constrain finance before final losses are known. The activity separates liquidation price, marked value and maturity payment. Announced rules link them; a price decline need not be entirely a fundamental loss, and a future recovery need not resolve a present financing constraint.

2.2 A worked example without an additional sale discount

Start with the no-sale-discount condition to hold price at sixty. An investor bought two securities using 100 of own funds and 100 debt. The position is worth 120, equity is twenty and maintenance would require thirty. With no contribution or voluntary sale, 0.67 securities are liquidated. Proceeds are 40.20, debt falls to 59.80 and 1.33 securities remain worth 79.80. Position equity remains twenty; twenty divided by 79.80 is slightly above twenty-five percent because quantities are discrete. Selling reduces both assets and liabilities and does not create equity at an unchanged price.

The bank initially lent 100 from 160 cash and retained sixty. It receives 40.20 from liquidation, raising cash to 100.20. Its direct security is worth sixty and its outstanding loan 59.80. Total assets are 220. Without withdrawal, the deposit promises 210 at maturity, including ten interest. Marked capital is ten. There is substantial cash and assets exceed obligations, yet a separate constraint limits new lending. This is a useful case precisely because low credit does not require an empty cash drawer or negative bank capital.

The classroom capital ratio is fifteen percent against simplified exposure. Existing marked risky assets are 119.80, combining the direct security and loan. Capital ten would permit total exposure of about 66.67. Since existing exposure already exceeds that amount, new-loan capacity is zero. The loan is not subtracted again from capital; it counts as exposure. A firm can invest its own twenty and produce twenty-five but obtains no new loan in this example. Students should identify each step before interpreting the final output difference.

Compare with no shock while retaining those initial choices. The security is worth 100, there is no forced sale, and the bank retains sixty cash, 100 security value and 100 loan value. After recognizing promised deposit interest, marked capital is fifty. The capital limit would allow more than sixty additional lending, but cash restricts the offer to sixty. If the manager offers sixty and the firm uses it with twenty own funds, output is 100 and repayment sixty-six. Firm wealth is thirty-four. This sequence shows how different constraints can bind under different prices.

These are feasible choices for teaching the accounts, not optimal actions prescribed to students. Participants can offer or request less, retain reserves, withdraw or decline investment. In the reference with sale discounts, the common price is recalculated as well. Do not describe the sixty used for the simplified example as the reference's final liquidation price. A clear lesson first solves fixed-price accounting, then adds feedback and checks which additional numbers change. The software records both the decision inputs and resulting adjustment path for this purpose.

Checkpoint

Reconstruct 100.20 cash, sixty security value and 59.80 loan value before discussing constraints. Then explain capital ten and why 100 ECU cash does not authorize new credit. Adding assets correctly and interpreting the lending limit are separate checks.

2.3 Withdrawals, support and ownership

A paid early withdrawal reduces bank cash and deposit principal by the same amount. Selling part of a direct bank security to meet that withdrawal adds to the volume determining the common price. An unserved request does not vanish; it retains a later claim. Remaining unconverted principal promises an additional five percent. The 180 minimum in the liquidity-need condition belongs to the scenario and is not a voluntary choice attributed to the representative. Requested, paid and still outstanding withdrawals should be distinguished in discussion.

A public equity purchase adds cash and equity while issuing a public ownership stake. A public loan adds cash and an equal liability, creating no equity by itself. It can avoid sales and indirectly preserve value, but that effect must be separated from the initial identity. Eligibility requires provisional solvency after the equity purchase and a loan no greater than eighty percent of provisional remaining bank securities' value. This is not an unlimited credit line for any bank and not a description of every real public facility.

Deposit conversion reduces outstanding principal and removes its corresponding promised interest. In exchange, the depositor receives a residual equity stake. No new cash enters. Three weights divide final equity: positive marked old capital before support, the public equity purchase, and 1.05 times converted principal. Normalize those weights and allocate leftover cents by proportional remainders. If all weights are zero, the original owner retains any residual. An owner with negative prior capital can be diluted entirely when new ownership claims enter. These are transparent classroom issuance rules rather than market valuations of a real transaction.

At closing, the public facility has priority over remaining deposits, followed by interbank debt and residual equity. Already-paid early withdrawals reduced liabilities before that closing. In the interbank condition, bank two settles first so its actual payment to bank one becomes a real counterparty receipt. The priority schedule is an announced teaching rule, not a legal description of insolvency in a particular country. Students should use that schedule consistently instead of importing an assumed priority from another institution.

2.4 Investment and consolidated accounts

New-loan capacity is the minimum of available cash, capital headroom and a 200-ECU ceiling. A bank must preserve provisional solvency. Managers can offer less and firms can use less than offered. Firms decide how much of their own twenty to invest. Reference output is 1.25 times total investment and debt promises 1.10 times borrowing. Repayment cannot exceed project output; uninvested own cash stays outside that collateral. A production loss can therefore affect both the firm and its lender without requiring an additional hidden-effort decision.

With twenty own funds and forty borrowed, investment is sixty, output seventy-five, repayment forty-four and wealth thirty-one. Lower productivity can cause default when own contributions are small. The activity does not add hidden effort or adverse selection, which already have dedicated families. Its question is how financial capacity and an effective offer determine project scale, and how a project repayment shortfall returns to a creditor's account. Separate the promised interest from principal before labeling a shortfall a principal loss.

Consolidation includes owners, investors, depositors, firms and the treasury, together with external issuer, liquidation intermediary and project-sector accounts. Loans and deposits cancel against counterparts rather than being counted twice as newly created wealth. The program requires an identity discrepancy of zero cents. The authority's social score is excluded because it is an exercise indicator rather than money transferred from another participant. This check is an accounting acceptance criterion, not a claim that the economy has produced no real gains or losses.

Modes and mechanism comparisons

3.1 Choose a useful contrast

The basic edition offers one episode, ten with a fixed group, and ten with role-preserving reassignment. One episode contains the full chain and is the recommended starting point for substantive discussion. Fixed groups keep people and functions together. Reassignment forms new economies while preserving each person's function and requires at least eighteen participants. A previous partner may be encountered again; the procedure does not promise perfect separation across successive groups. All grouping requirements refer to real trajectories, not simulated people.

Resources reset every episode. Repetition examines learning under known rules, without automatically reducing later endowments after an earlier loss. It is not ten periods of one bank accumulating capital. This matters when linking the activity to dynamic finance models. Practice can be distributed across classes, but ten repetitions are not necessary to teach the mechanism and do not guarantee better understanding. Plan time to interpret outcomes instead of treating a larger number of records as the principal instructional achievement.

The extended edition has sixteen conditions per language, including an integrated reference. Each extended configuration uses one episode for a focused comparison. These are not sixteen separate catalogue games and should not all be run in one class. Select a question, anticipate the changed rule and document what remains constant. Behavioral differences across small sessions are illustrative. Causal identification requires assignment, independent units and a protocol that a curricular sequence alone does not provide. Keep a distinction between a controlled arithmetic contrast and a behavioral treatment comparison.

3.2 Shocks, sales and constraints

Reference and no cash-flow shock

The reference announces a maturity payment of sixty, a one-ECU discount per unit sold, twenty-five percent maintenance margin and a fifteen percent capital ratio. The no-shock condition retains a payment of 100 and the other rules. Their comparison separates a fundamental decline from system responses. Output can differ even without withdrawals or universal final default because marked capital restricts credit before maturity. Read the actual choices rather than assuming all investors take the maximum loan.

Do not describe the calm condition as universally riskless or the reference as an unannounced surprise. Participants know the episode rules and may anticipate them, reduce borrowing or retain resources. That reaction belongs to the outcome. Maximum borrowing is a feasible sequence

making the accounting transparent, not behavior forced by the program to guarantee a visible crisis. If borrowing is low, discuss which amplification channel remains inactive and which direct bank exposures still exist.

No sale discount

Market impact is set to zero. Liquidation price remains at the scenario fundamental despite sales, while margin, credit, deposits and support choices remain available. This shows which difficulty arises from cash-flow value and which can be amplified by limited depth. It also permits solving the sixty-price accounting example before introducing iteration. A stable price does not mean there are no liquidity needs or collateral actions.

Forced sales can still occur: removing the discount does not remove maintenance margin. Nor does it eliminate opportunity costs or a smaller firm loan. Compare quantities sold, price and financing limits instead of assigning every output decline to one channel. First reconstruct consequences holding a decision pattern fixed, then discuss actual choices separately. The former is a mechanical exercise; the latter includes responses to the institutional rule.

No capital-ratio restriction

The capital ratio is removed for additional lending while cash, the 200-ECU ceiling and the prohibition on new credit by provisionally insolvent banks remain. Banks cannot lend nonexistent resources and insolvency still matters. This changes one restriction rather than creating a frictionless economy. It is useful for showing that a bank can have cash but limited capital headroom, without teaching that every capital-related concern disappears when a particular ratio is removed.

The report also shows capacity without the ratio for each observed economy. This retains that session's balance and choices, so it is a mechanical comparison. It does not describe what a manager would have chosen under another rule. Use both levels: identify the binding restriction with given data, then compare sessions if studying responses to an institutional change. Do not call the difference between two computed ceilings a measured causal effect on investment.

No automatic margin call

Maintenance margin becomes zero. Voluntary sales and contributions remain possible, and debt remains outstanding. At maturity, the lender recovers up to available collateral value. Creditor losses can therefore occur without automatic liquidation. Removing a call does not forgive the loan or ensure bank capital is preserved. Its interpretation depends on the distinction between a contractual response to current collateral and the eventual payment on retained assets.

Ask whether a rule protecting an individual contract can generate sales affecting other accounts. Do not presume that removing it is always preferable. A retained position may recover value or default more severely. Outcomes depend on announced payments, reserves and other decisions. Separate a collateral-management procedure from a universal policy recommendation. Use final repayment and earlier credit capacity to show that ex post recovery and ex ante financing are different questions.

Severe fundamental loss

The maturity payoff falls to thirty while support opportunities and other rules remain. This condition makes more pronounced insolvency and limits to liquidity lending visible. If a bank

is ineligible, the authority cannot resolve it merely by creating more public debt for that bank. Equity support can restore capital but uses budget and changes ownership. A grant large enough to affect cash may still be insufficient to restore a lending capacity under the announced exposure ratio.

Compare assets and obligations before selecting an instrument. A zero interest rate does not turn a liability into equity. The scenario is not a historical loss frequency or a calibration of real asset values. Its intensity clarifies the difference between temporary funding need and a loss someone must absorb. If the public budget cannot restore every institution, the resulting allocation problem should be discussed with the objective weights and costs stated.

3.3 Deposits and bank composition

Withdrawal needs with sound assets

The security pays 100 and each representative must request at least 180 of withdrawal, up to 200. The minimum is an exogenous scenario need rather than a voluntary participant choice. Assets may have enough fundamental value while the bank still needs immediate cash or a discounted sale. This makes maturity and value distinct. The actual voluntary choice is the amount above the minimum, rather than the whole observed request.

Do not count the compulsory withdrawal as evidence of panic. One representative per bank does not reproduce the many-depositor coordination game already in the catalogue. The question concerns transmission from liquidity demand to sales and firm lending. Compare public budget, collateral eligibility and how support changes sales, without assuming every withdrawal reveals distrust. A sound asset can coexist with costly funding needs, particularly when redemption and withdrawal occur at different times.

More liquid bank portfolios

Banks open with 200 cash and 0.60 securities worth sixty. Total assets, deposits and initial equity remain 260,200 and sixty. Composition changes without gifting capital. More cash can facilitate withdrawals, and smaller direct security exposure also reduces losses from a price decline. Acknowledge both consequences. This is not an intervention varying liquidity alone while preserving every exposure. Equal initial equity is not sufficient to make all later risks identical.

First reconstruct the opening identity and explain why a given withdrawal requires fewer sales. In a separate exercise, hold withdrawal at zero to examine exposure differences. Keeping those exercises distinct prevents a short treatment label from substituting for analysis of the balance sheet. If outcomes differ, name the changed resource and changed exposure instead of attributing everything to a general notion of bank strength.

Deposit principal protection

Insurance raises the representative's wealth to 200 when early payments, late payments and equity proceeds do not cover principal. Promised interest is not insured. A separate 400 fiscal fund covers both banks' principal and records payments as costs. It is not freely available to managers and does not automatically cover losses of all other roles. The fund cannot be spent a second time as discretionary equity assistance.

Protection may change withdrawal choices, but can also pay without altering the bank loss that caused the shortfall. Show both accounts: what the depositor receives and what bank capital

remains. A protected deposit does not establish intermediary solvency. Nor is a smaller withdrawal request conclusive evidence of better information, because collection rights changed. Use insurance payments and bank equity together rather than reading only the depositor's final wealth.

3.4 Intervention tools and rights

Liquidity loans only

Public equity purchases are disabled. The authority can lend within budget and eligibility limits and the money is owed back with priority at closing. This makes clear that a liquidity line does not directly add capital. It may prevent discounted sales and indirectly preserve value; read that consequence alongside the new liability. A bank with a cash constraint and one with an equity deficit need not respond similarly to the same nominal loan.

The authority may choose zero. Availability is not an obligation to spend, and a large budget does not remove collateral requirements. If a bank is already provisionally insolvent, this condition limits what can be done. That limit is an announced classroom rule, rather than a claim about every real public facility. Discuss whether the binding restriction was eligibility, budget, cash or a choice not to intervene before comparing final output.

Public equity only

Liquidity loans are disabled. Each ECU allocated buys ownership and adds cash and equity. At settlement the public sector receives its share of the residual. Recapitalization need not be a subsidy whose entire amount is lost: net fiscal cost subtracts recoveries. Nor is it free money for the old owner because relative ownership shrinks. The report keeps the gross allocation and ultimate public wealth conceptually separate.

Compare initial expenditure and closing public equity proceeds. If prior marked capital was negative, old ownership can be extinguished and new capital bears the residual risk. The formula is a transparent activity rule, not a market valuation of a real transaction. Its purpose is to make ownership, loss absorption and future financing visible. A profitable fiscal recovery is possible within these parameters and should be reported rather than removed to fit a predetermined narrative.

No public intervention

The support budget is zero and the authority still observes outcomes and receives a score. No fictional transfer is required to make that role advance. This condition shows the chain without public equity or liquidity loans while retaining private choices and explicit disabled tools. The authority's decision page acts as a checkpoint with no impossible spending fields. Progress should not depend on entering a positive number from an unavailable budget.

A comparison with assistance can reveal productive benefits and distributional costs without establishing an optimal policy. The score uses stated weights, while a real social evaluation would need to justify objectives, risk and alternative costs. Separate success under the classroom scoring rule from a general recommendation to rescue or close banks. Encourage students to identify which costs the exercise includes and which real considerations would require an expanded model.

Deposit conversion into equity

The authority may convert zero to 100 percent of principal remaining after early payments. Converted deposits cease to be debt carrying promised interest and become residual equity. Conversion does not itself change cash. This contrasts a loss-absorption instrument with one supplying new funds. The percentage applies to remaining principal, not automatically to the initial 200 once withdrawals have already reduced the claim.

The representative receives a stake whose realized value can be above or below the canceled claim. Reducing liabilities does not create consolidated wealth automatically: someone gives up a fixed right and accepts residual risk. The 1.05 weight recognizes the eliminated interest as well as principal. Track that stake through the final waterfall instead of treating conversion as a lossless repayment. Bank lending capacity may change even when its cash balance does not.

Equity for bank 1 (ECU)

0

Equity for bank 2 (ECU)

0

Public loan to bank 1 (ECU)

0

Public loan to bank 2 (ECU)

0

Remaining bank 1 principal converted (%)

50

Remaining bank 2 principal converted (%)

50

Continue

Figure 3.1: Conversion adds controls over remaining principal and does not add cash.

3.5 Exposures, output and information

Interbank exposure

Bank one lends thirty to bank two before decisions. The first bank loses cash and gains a claim; the second gains cash and records equal debt. Consolidated wealth is unchanged. Prices and losses can affect the marked claim. At maturity, the debtor settles first and actual recovery passes to the creditor. The same transfer cannot be counted as new funding for both banks after it has already changed hands.

The network has one direction and does not represent an entire financial system. It lets the

class follow a counterparty loss through an identifiable obligation. Both banks can also suffer the common shock, so not all losses at bank one should be attributed to the link. Use actual unpaid exposure and direct holdings to distinguish transmission from a shared disturbance. More complex network topology would require a different design and evidence rather than a verbal extension of this two-node case.

Project productivity loss

Output becomes 0.60 times investment while promised repayment and project limited liability remain. This can create additional credit losses. The firm retains uninvested own funds and uses project output to service debt up to what is available. A larger own contribution may still permit repayment despite lower productivity. Compare the promised debt, actual output and protected reserve before concluding that every firm must default.

There is no added hidden effort or adverse selection. The purpose is to follow real-sector damage back to the lender and, where relevant, to interbank claims. Compare financed investment, output and repayment. The gap between output and promised payment is not always a principal loss because the promise includes interest. A firm can fail to pay all interest while the bank recovers its original loan; those outcomes should not be merged into one undifferentiated default measure.

Both bank balance sheets visible

The scenario projection shows both banks to all participants. In the reference each private role sees its associated bank, while the authority has both for support decisions. Added information describes a reference simulation, not future decisions revealed early. It contains no names or personal identifiers. The common table does not make every individual action or private resource automatically observable.

Ask how a system-wide view changes a decision normally made from an individual bank's balance. Payoffs are unchanged and all private actions are not disclosed. Read the projection's assumptions before interpreting it as a forecast. A broader view can help identify constraints without guaranteeing comprehension or coordination. A difference between conditions can reflect use of the information, misunderstanding or unrelated small-sample variation, so the lesson should separate access from demonstrated understanding.

Scenario and reference balance sheet

Deposit representative Bank 1 · Episode 1/1

Securities are acquired at 100 ECU. In this scenario they pay 60.00 ECU at maturity. The sale price starts at that payoff and falls by 1.00 ECU per unit sold by investors and banks, with a 20-ECU floor. Calculations restart from the same choices and repeat liquidations; price only falls until stable. This is not an order auction.

This projection assumes zero contributions and voluntary sales and only compulsory minimum withdrawal. It is not the outcome of the choices you will make now. You see your own bank unless both balances are public.

Liquidation price: 58.26 ECU

Bank	Cash	Marked capital	Marked secured loan	New credit capacity	Provisional public loan limit
1	110.69	8.26	49.31	0.00	46.61
2	110.69	8.26	49.31	0.00	46.61

Continue

Figure 3.2: The information condition displays both banks under explicit assumptions.

Preparation, classroom experience and interpretation

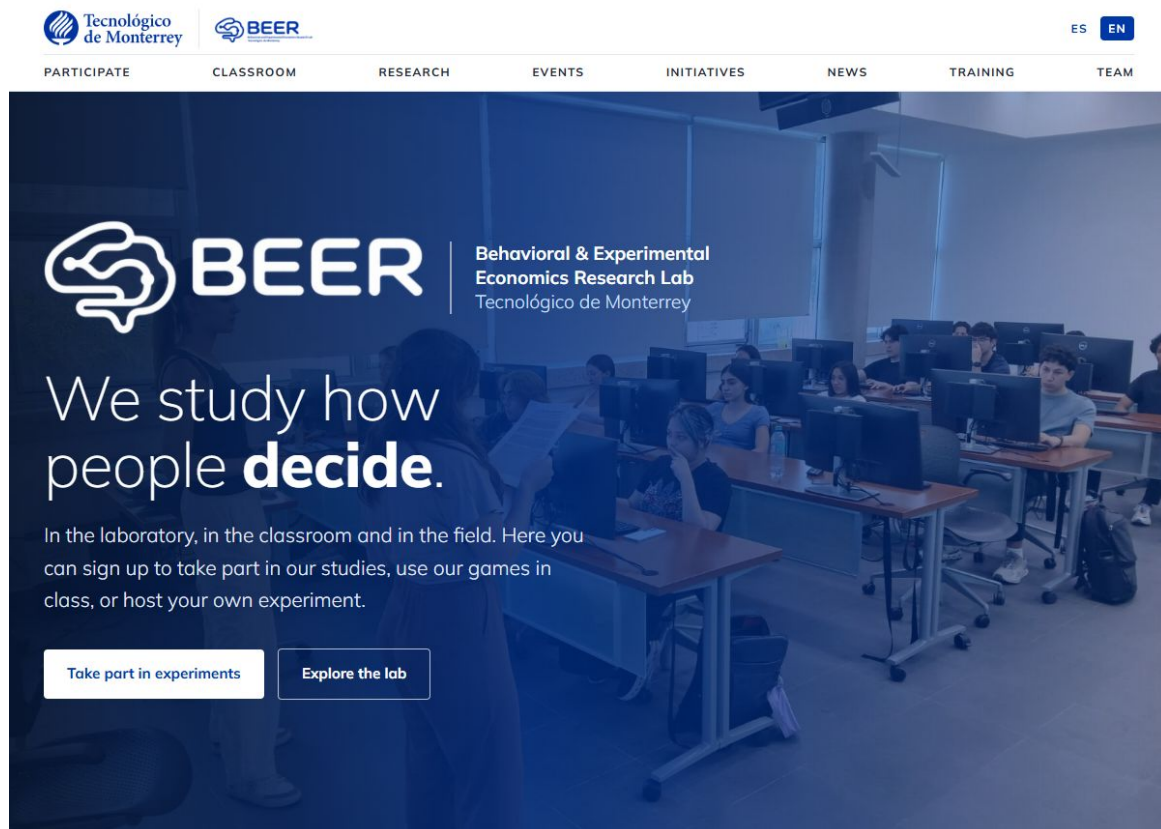
4.1 Access and organization

Start at <https://beer-lab.org/> and open the classroom catalogue at <https://teaching.beer-lab.org/>. Find Financial Crisis and Real-Sector Transmission. The family route is <https://financialcrisis.beer-lab.org/>. English basic participants use https://financialcrisis.beer-lab.org/room/financial_crisis_en, and extended participants use https://financialcrisis.beer-lab.org/room/financial_crisis_extended. Instructors use <https://financialcrisis.beer-lab.org/demo> and authenticated administration. These addresses identify the prepared product; the delivery record distinguishes local verification from public publication. A working local page is not evidence that public DNS and deployment are complete.

Demo contains thirty-eight family configurations and Rooms contains four rooms, separated by language and edition. Each basic room offers three modes and each extended room sixteen conditions. The basic selector should initially choose a basic mode in the correct language. A room is different from a personal participant link, and the instructor report is private. If other families appear, do not start class; consult laboratory coordination about isolation. The local preview opens at <http://localhost:8111/demo> on the same computer. Keep the instructor's authenticated tab separate from participant screens.

Use multiples of nine, with a minimum of nine for one episode or fixed groups and eighteen for reassignment. Both form and server enforce this requirement. Twenty-seven or thirty-six students form three or four economies with all roles human. For an incomplete multiple, organize external observers or a team making a joint decision on one device and identify it as such. Do not create fictional people or treat a shared trajectory as independent choices from several students. Observation units should match the actual classroom organization.

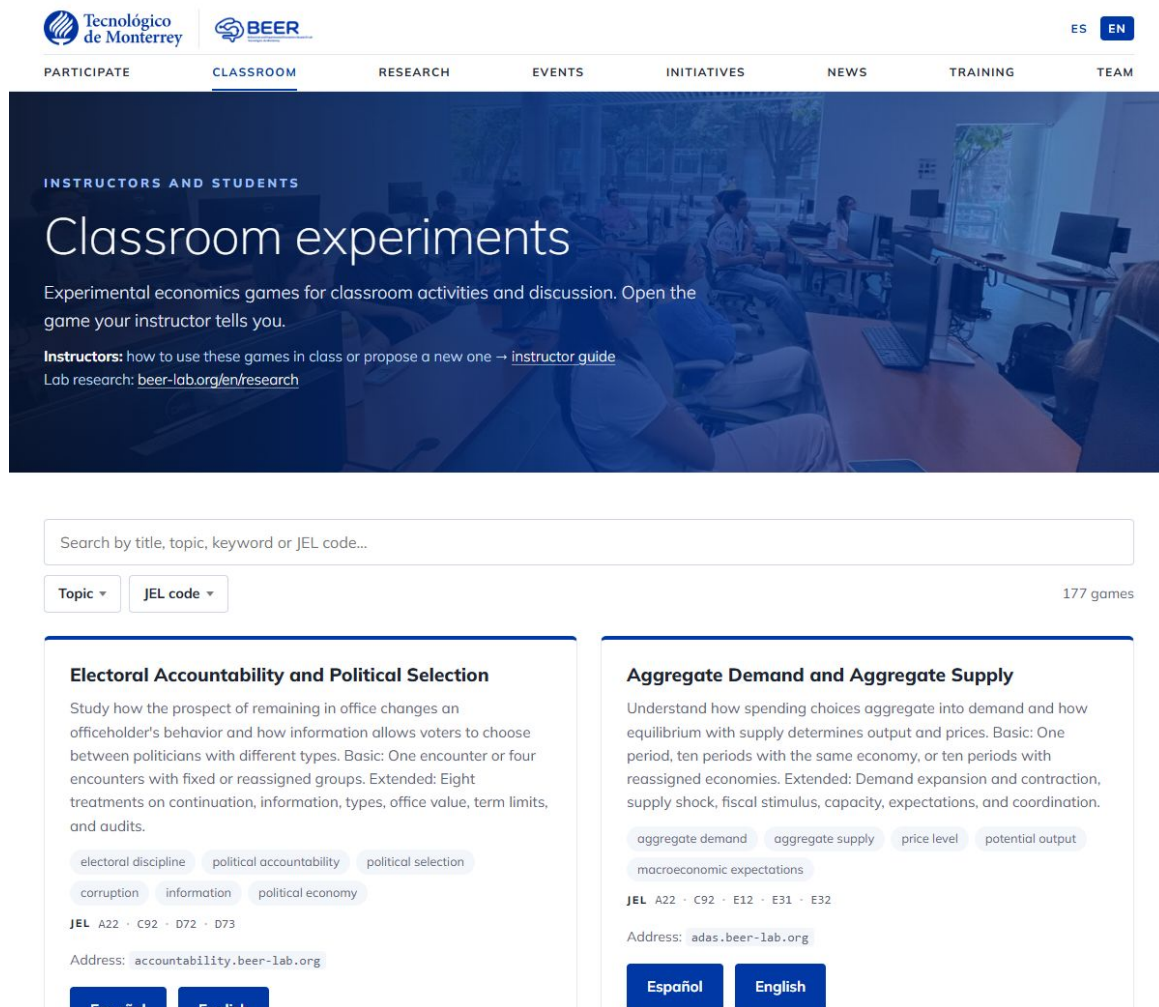
Allow two meetings of seventy-five to ninety minutes for a first application with a comparison and discussion. Effective time depends on reading, experience and questions; these are planning estimates rather than measured human-pilot results. The first meeting can prepare accounts and run the reference, and the second can reconstruct outcomes and compare a condition. Ten episodes need multiple meetings or additional time. Do not sacrifice explanation of obligations merely to increase repetitions. Confirm devices, connections and privacy before assigning roles.



WHAT WE DO

A lab for participants, instructors and researchers

Figure 4.1: Institutional access to the classroom catalogue.



Tecnológico de Monterrey **BEER** ES EN

PARTICIPATE **CLASSROOM** RESEARCH EVENTS INITIATIVES NEWS TRAINING TEAM

INSTRUCTORS AND STUDENTS

Classroom experiments

Experimental economics games for classroom activities and discussion. Open the game your instructor tells you.

Instructors: how to use these games in class or propose a new one → [instructor guide](#)
 Lab research: beer-lab.org/en/research

Search by title, topic, keyword or JEL code...

Topic ▾ JEL code ▾ 177 games

Electoral Accountability and Political Selection

Study how the prospect of remaining in office changes an officeholder's behavior and how information allows voters to choose between politicians with different types. Basic: One encounter or four encounters with fixed or reassigned groups. Extended: Eight treatments on continuation, information, types, office value, term limits, and audits.

electoral discipline political accountability political selection corruption information political economy

JEL A22 · C92 · D72 · D73

Address: accountability.beer-lab.org

Español English

Aggregate Demand and Aggregate Supply

Understand how spending choices aggregate into demand and how equilibrium with supply determines output and prices. Basic: One period, ten periods with the same economy, or ten periods with reassigned economies. Extended: Demand expansion and contraction, supply shock, fiscal stimulus, capacity, expectations, and coordination.

aggregate demand aggregate supply price level potential output macroeconomic expectations

JEL A22 · C92 · E12 · E31 · E32

Address: adas.beer-lab.org

Español English

Figure 4.2: The catalogue allows searching existing financial mechanisms.

Demo

Crisis financiera — Un episodio	Crisis financiera y transmisión al sector real / Financial Crisis and Real-Sector Transmission — BEER Lab Seleccione una variante de este juego. Select a version of this game.
Crisis financiera — Diez episodios: grupo fijo	
Crisis financiera — Diez episodios: reasignación por rol	
Crisis financiera — Extendida: Referencia integrada	
Crisis financiera — Extendida: Sin shock de flujos	
Crisis financiera — Extendida: Sin descuento por ventas	
Crisis financiera — Extendida: Sin restricción de capital	
Crisis financiera — Extendida: Sin llamada de margen	
Crisis financiera — Extendida: Necesidad de retiros con activos sanos	
Crisis financiera — Extendida: Pérdida fundamental intensa	
Crisis financiera — Extendida: Cartera bancaria más líquida	
Crisis financiera — Extendida: Protección del principal depositado	
Crisis financiera — Extendida: Solo préstamos de liquidez	
Crisis financiera — Extendida: Solo capital público	
Crisis financiera — Extendida: Sin intervención pública	
Crisis financiera — Extendida: Exposición entre bancos	
Crisis financiera — Extendida: Conversión de depósitos en capital	
Crisis financiera — Extendida: Pérdida de proyectos	

Figure 4.3: Demo selection: thirty-eight configurations of this family.

Rooms

Current rooms:

Crisis financiera — Básica
Financial Crisis — Basic
Crisis financiera — Extendida
Financial Crisis — Extended

Figure 4.4: Four rooms by language and edition.

Room: Financial Crisis — Basic

Create a new session

Session Config

Financial Crisis — One episode

Number of participants

Complete groups of 9 participants. Use a multiple of 9; minimum 9.

Create

[Configure session](#) 

App sequence

financial_crisis_game (10 rounds)

0 participants present

Start links

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

Room-wide URL

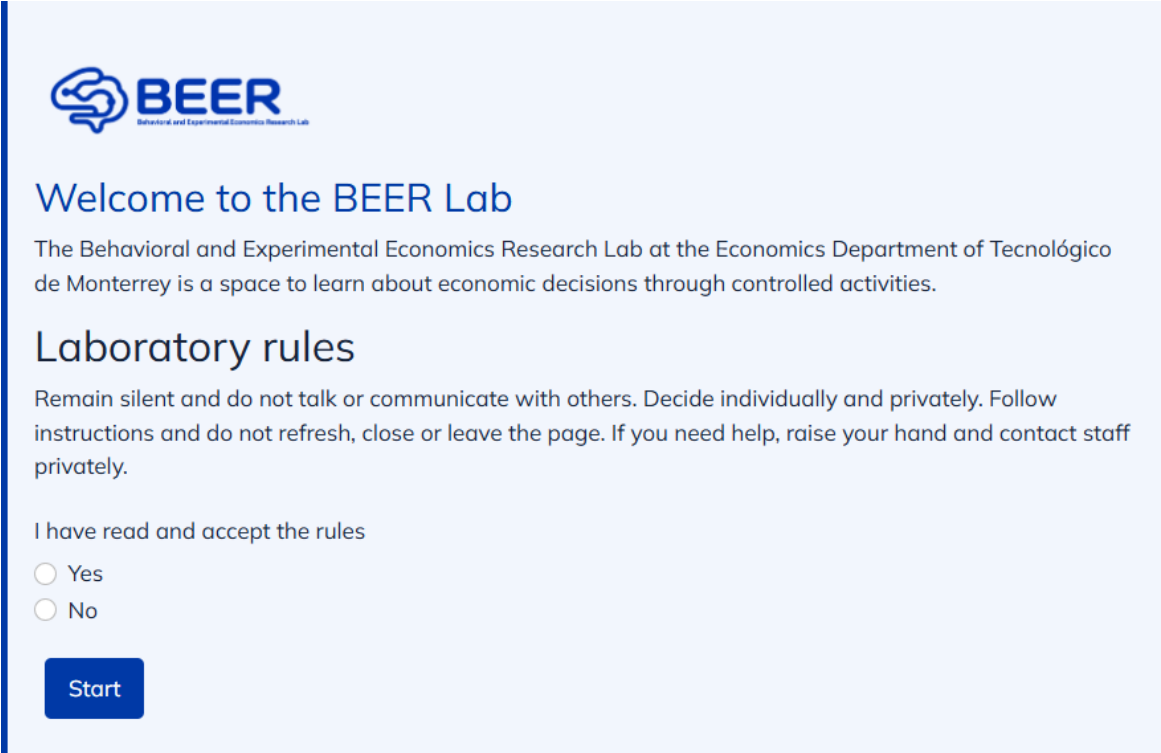
Here is the room-wide URL anyone can use. Don't use this link when testing in multiple tabs on the same browser, because all tabs will be assigned to the same participant, using a cookie.

http://127.0.0.1:8111/room/financial_crisis_en

Figure 4.5: Basic room: check language and multiples of nine.

4.2 The participant experience

The welcome page identifies the laboratory and its rules: silence, private decisions, following screens and asking staff privately for help. Instructions then show role and effective resources. No demographic questions are asked. Comprehension checks a shared public budget, output arithmetic and the liability created by a loan. Every error explains its corresponding calculation and retains other responses. Correction does not reduce ECU or reveal a recommended strategy. The aim is understanding the contract and sequence, not steering choices toward a predicted crisis.



BEER
Behavioral and Experimental Economics Research Lab

Welcome to the BEER Lab

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

Laboratory rules

Remain silent and do not talk or communicate with others. Decide individually and privately. Follow instructions and do not refresh, close or leave the page. If you need help, raise your hand and contact staff privately.

I have read and accept the rules

☐ Yes

☐ No

Start

Figure 4.6: Welcome and rules before decisions.

Offer and portfolio pages involve different choices. Managers set financing limits; investors choose use and reserves. The following projection introduces the scenario without publishing every individual choice. Response pages appear only for investors and deposit representatives while others wait. Role screenshots help the instructor anticipate questions but should not be projected with identifiable real decisions during a running session. Private access to a bank-level projection is not the same as permission to inspect another person's full trajectory.

The authority sees provisional assessments of both banks and only enabled controls. Managers then observe updated credit limits and firms receive offers. System capacity and personal choice are different: managers may offer below the ceiling and firms may borrow below the offer. Ask about both steps before interpreting low output as entirely caused by bank constraints. A rejected loan request should prompt inspection of the actual offer and resources rather than an assumption that the software should permit every number below the global ceiling.

Settlement is role-specific. Managers see owner residual, investors wealth after sales and debt, representatives early and late payments, insurance and equity proceeds, and firms investment, output and repayment. The authority sees its score and public accounts. The final page confirms the mean credited once. No participant ends at an unexplained technical page. A person finishing earlier should remain silent until common instructions, especially if other economies are still deciding. The final credited amount and fiscal account balance should not be confused for the

Understanding the rules

Resources and unit of account

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

This session does not convert ECU into real money.

Bank manager Bank 1 · Episode 1/1

If the authority allocates 60 ECU to equity and 30 to loans from a 100-ECU budget, how much remains?

Your answer: 0. The correct answer is 10. $100 - 60 - 30 = 10$ ECU. Equity and liquidity share the budget.

In the example with total investment 60 and productivity 1.25, how much output is produced?

How much new liability does a 10-ECU public loan create?

Continue

Figure 4.7: Feedback explains the budget and preserves other responses.

Initial financing offer

Bank manager Bank 1 · Episode 1/1

Liquidation price: 60.00 ECU

Offer to the investor (ECU, 0–100)

Continue

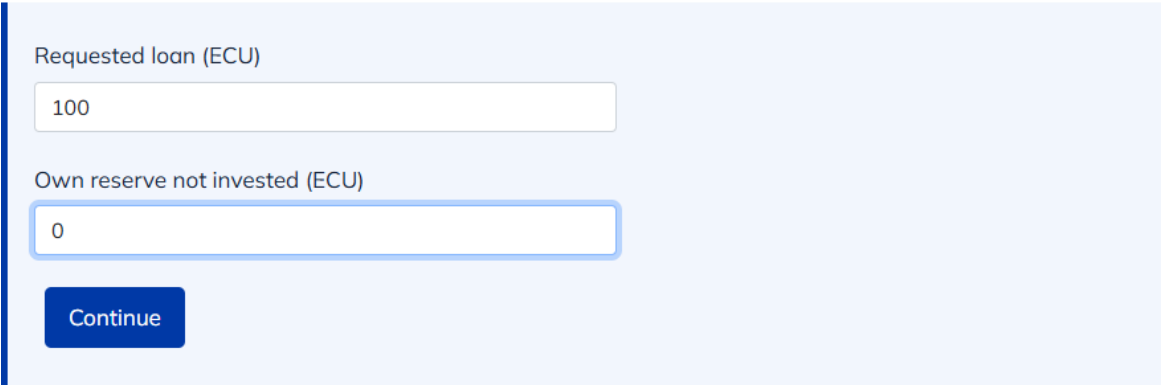
Figure 4.8: The manager offers the investor a loan limit.

Reserve and security financing

Investor Bank 1 · Episode 1/1

Offer to the investor (ECU, 0–100): 100 ECU · Own reserve not invested (ECU): · Loan: · Voluntary security sale (steps of 0.01): 0

Liquidation price: 60.00 ECU



Requested loan (ECU)

100

Own reserve not invested (ECU)

0

Continue

Figure 4.9: The investor chooses loan use and own reserve.

Scenario and reference balance sheet

Deposit representative Bank 1 · Episode 1/1

Securities are acquired at 100 ECU. In this scenario they pay 60.00 ECU at maturity. The sale price starts at that payoff and falls by 1.00 ECU per unit sold by investors and banks, with a 20-ECU floor. Calculations restart from the same choices and repeat liquidations; price only falls until stable. This is not an order auction.

This projection assumes zero contributions and voluntary sales and only compulsory minimum withdrawal. It is not the outcome of the choices you will make now. You see your own bank unless both balances are public.

Liquidation price: 58.26 ECU

Bank	Cash	Marked capital	Marked secured loan	New credit capacity	Provisional public loan limit
1	110.69	8.26	49.31	0.00	46.61

Continue

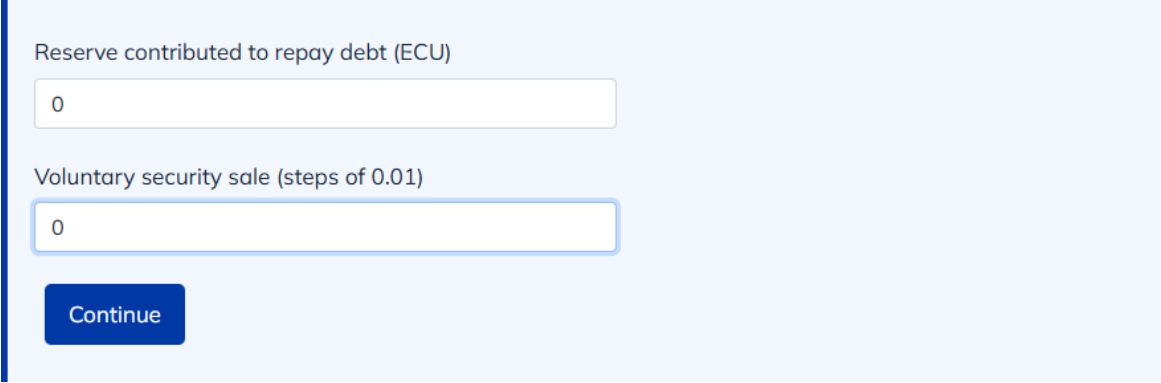
Figure 4.10: Reference projection showing only the associated bank.

Choices after the scenario

Investor Bank 1 · Episode 1/1

Offer to the investor (ECU, 0–100): 100 ECU · Own reserve not invested (ECU): 0.00 · Loan: 100.00 · Voluntary security sale (steps of 0.01): 2,0

Liquidation price: 58.26 ECU



Reserve contributed to repay debt (ECU)

Voluntary security sale (steps of 0.01)

Continue

Figure 4.11: Contributions and voluntary sales respect resource limits.

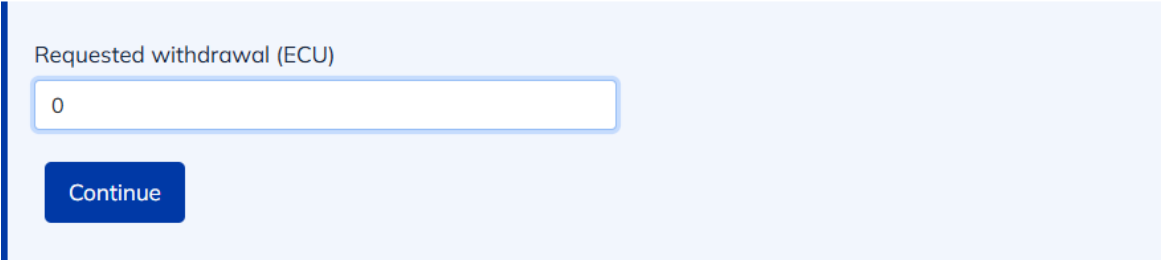
Choices after the scenario

Deposit representative Bank 1 · Episode 1/1

Scenario minimum withdrawal: 0 ECU.

You represent a 200-ECU deposit at your bank and have no additional initial cash. You can request early withdrawal. Paid withdrawals reduce the deposit; unpaid requests retain a later claim.

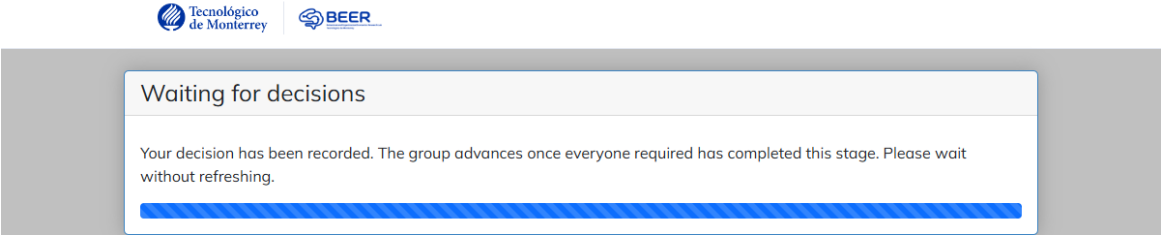
Liquidation price: 58.26 ECU



Requested withdrawal (ECU)

Continue

Figure 4.12: The representative requests withdrawal from the associated claim.



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Waiting for decisions

Your decision has been recorded. The group advances once everyone required has completed this stage. Please wait without refreshing.

Figure 4.13: Waiting synchronizes roles without disclosing other choices.

Equity for bank 1 (ECU)

Equity for bank 2 (ECU)

Public loan to bank 1 (ECU)

Public loan to bank 2 (ECU)

[Continue](#)

Figure 4.14: The authority allocates equity and loans within one shared budget.

New offer to the firm

Bank manager Bank 1 · Episode 1/1

Liquidation price: 58.26 ECU

Bank	Cash	Marked capital	Marked secured loan	New credit capacity	Provisional public loan limit
1	140.69	38.26	49.31	140.00	46.61

Maximum credit offered to the firm (ECU)

[Continue](#)

Figure 4.15: The manager observes current capacity and chooses a firm offer.

Firm finance and investment

Firm Bank 1 · Episode 1/1

Maximum credit offered to the firm (ECU): 140.00 ECU

Your firm holds 20 ECU of its own funds. After seeing the bank's offer, you may invest part of those funds and borrow up to the offer.

Output is 1.25 times investment financed by own funds and borrowing. Firm debt promises 1.10 times borrowing; repayment cannot exceed output. Uninvested own cash remains with the firm.

Liquidation price: 58.26 ECU

Bank	Cash	Marked capital	Marked secured loan	New credit capacity	Provisional public loan limit
1	140.69	38.26	49.31	140.00	46.61

Credit used (ECU)

Own funds invested (ECU, 0–20)

Continue

Figure 4.16: The firm distinguishes offered credit, credit use and own funds.

authority.

Personal outcome

Deposit representative Bank 1 · Episode 1/1

Early withdrawal paid	0.00 ECU
Deposit paid at maturity	210.00 ECU
Deposit equity proceeds	0.00 ECU
Insurance payment	0.00 ECU
Terminal wealth	210.00 ECU

Continue

Figure 4.17: Settlement separates deposit payments, insurance and residual ownership.

Personal outcome

Firm Bank 1 · Episode 1/1

Loan	140.00 ECU
Output	200.00 ECU
Repayment	154.00 ECU
Terminal wealth	46.00 ECU

Continue

Figure 4.18: The firm observes output, repayment and wealth.

4.3 The private report and denominators

The report first displays progress and hides aggregates until Reveal aggregates is selected. Hide aggregates returns to monitoring. The address requires authentication and should not be shared with students. Disclosure controls organize feedback but do not replace server permissions. Downloads contain technical records and should not be projected to single out individual decisions. Aggregates are appropriate for the group discussion; individual trajectories should be handled privately and with their economic context preserved.

A completed economy contributes nine personal outcomes, two bank balance sheets and one aggregate-output observation per episode. Each private-role mean has two observations per completed economy; the authority has one. Ten completed episodes with the same group produce twenty manager records but only two managers. Retain that dependence in interpretation. Economies, people and price iterations are not interchangeable units. Before comparing a mean, state how many economies and episodes generated it and whether the participants were repeated.

The report shows price, capital, credit capacity, capacity retaining only cash and solvency constraints, credit actually used, withdrawals, output, fiscal cost and accounting discrepancy. The

Personal outcome

Authority · Episode 1/1

Output	400.00 ECU
Net fiscal cost	-24.68 ECU
Final public account balance	124.68 ECU
Authority social score	182.00 ECU

Continue

Figure 4.19: The authority distinguishes social score and fiscal accounts.

Activity completed

Mean credited once: 182.00 ECU

The activity is complete. Please wait for the instructor's directions.

Figure 4.20: The final screen confirms one-time credit of the mean.

capacity comparison is mechanical: it removes one rule from the observed balance without claiming what people would choose under another institution. The output histogram uses frequencies across complete economy-episodes. Missing outcomes are not zeros, and a session without completed episodes has no observed mean equal to zero. A pending bank offer should not be interpreted as a deliberate refusal of financing.

The liquidation path distinguishes computational iterations from the security's maturity payment. The network identifies the interbank loan and actual loss. To discuss contagion, separate that loss from direct exposure to the common shock. Net fiscal cost subtracts final public wealth, including recoveries, from initial funds. It can be negative if a public equity stake yields more than its purchase cost. Gross expenditure should not be added up and labeled the final fiscal loss. The per-bank table helps preserve differences that aggregate capital alone can conceal.

Instructor report: financial crisis and transmission

Integrated reference · One episode

Participants: 9 · Completed episodes: 1 · Pending episodes: 0

The interactive unit is a nine-person economy per episode. Do not confuse roles, price iterations and episodes. Capacity without the capital ratio preserves cash and solvency: it is a mechanical comparison, not a causal effect. The authority's score is excluded from financial wealth.

Reveal aggregates

[Download round data](#) · [Download native data](#)

Economy progress

Episode	Recorded stage
1	6/6

Figure 4.21: Aggregates remain hidden until instructor disclosure.

Wealth and score by role

Your role	Mean episode outcome	Observations
Bank manager	11.66	2
Investor	18.49	2
Deposit representative	210.00	2
Firm	46.00	2
Authority	182.00	1

Figure 4.22: Role means with outcome denominators, keeping scores distinct from wealth.

Price, credit and output by episode

Episode	Liquidation price	Marked capital	New credit capacity	Capacity without capital ratio	Loan	Early withdrawal paid	Output	Net fiscal cost	Consolidated identity discrepancy
1	58.26	76.52	280.00	280.00	280.00	0.00	400.00	-24.68	0

Net fiscal cost equals initial public funds minus final public wealth, including recoveries and insurance. It can be negative when public equity yields more than its purchase cost.

Figure 4.23: The chain shows capacity, actual credit use and output.

Output distribution across economies

Observations: 1

0–50 ECU: 0

50–100 ECU: 0

100–200 ECU: 0

200–400 ECU: 0

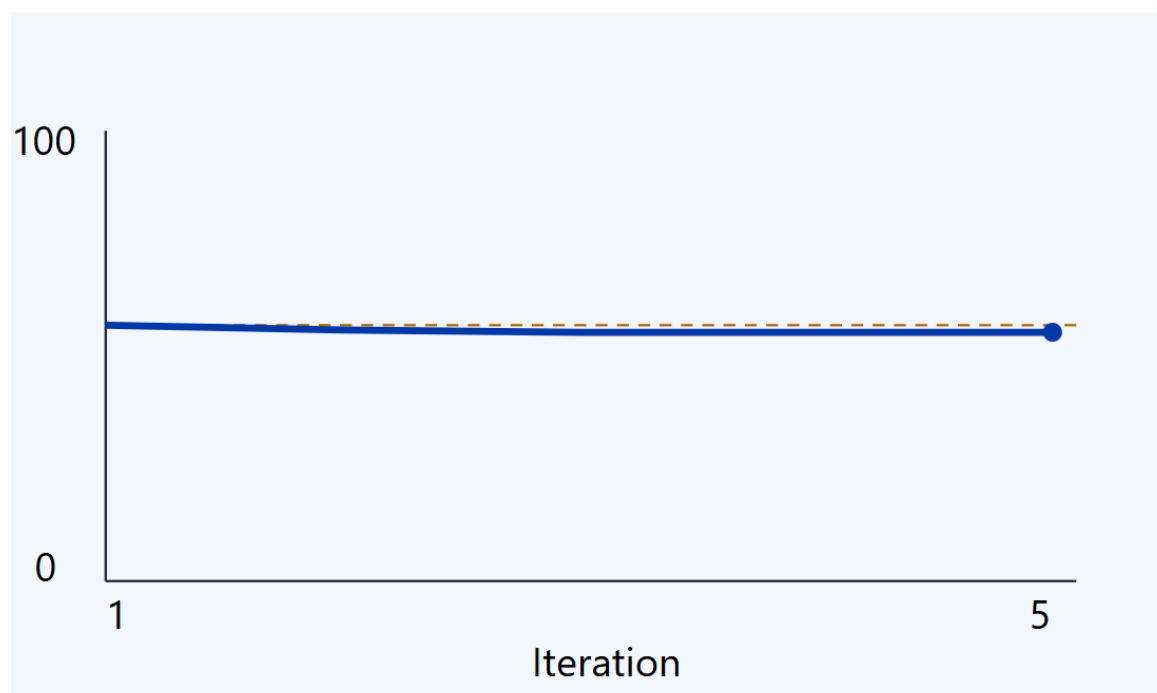
400+ ECU: 1



Figure 4.24: The distribution counts complete economies rather than people or iterations.

Liquidation price path

Episode 1 · Iteration: 5



Liquidation price: ECU · Security payoff at maturity: - - -

Figure 4.25: The path distinguishes liquidation iterations and the fundamental payment.

For the instructor

Before interpreting a number, name its unit and denominator. Then identify whether it is a choice, accounting consequence, algorithmic rule or hypothetical comparison. Only then propose an economic explanation. One integrated session can reconstruct mechanisms without automatically identifying causal effects among all of them.

4.4 Feedback script and assessment

Feedback script

Select a loss and follow its counterpart. Ask whether it reflects a smaller fundamental cash flow, a discounted sale, a transfer or default. Then locate the constraint limiting credit and the firm decision determining output. Do not use the word crisis as an explanation for an account that has not yet been reconstructed.

Before revealing results, request short answers explaining cash versus equity, an event reducing debt, and the choice determining actual investment. Follow one loan through the bank: cash leaves, a claim appears and exposure changes. Then follow a withdrawal: resources leave and liabilities decline. Compare a loss: asset value falls without an automatic reduction of the deposit. These three operations help distinguish transfers, financing and loss absorption. Ask students to state both sides of each operation before introducing a policy interpretation.

Choose one economy and trace the whole chain: fundamental change, voluntary and automatic sales, final price, marked capital, capacity, offer, use and output. If a firm uses less than available credit, do not attribute that difference to capital regulation. If support prevents sales, separate its

cash effect from its indirect price effect. If output does not change between cases, ask whether another constraint remains binding in both. A flat output comparison can be informative about bottlenecks rather than evidence that financial institutions never matter.

Evaluate verifiable explanations rather than the highest wealth. Endowments and objectives differ by function. Someone retaining cash or declining to lend may reason coherently or may misunderstand a rule; a written answer helps distinguish those possibilities without assuming either. For transfer, present a bank with cash 100, capital ten and exposure 120. Ask why a liquidity facility may fail to solve its capital limit. The answer should distinguish adding a matching asset and liability from increasing loss-absorbing resources, while allowing an indirect effect if avoided sales preserve value.

A second exercise converts fifty of remaining principal into equity. A correct answer removes fifty principal and its five-percent promised interest, increases equity by 52.50, and adds no cash. A third compares gross assistance thirty with public recovery thirty-five: net fiscal cost for that operation is minus five before other items are included. A fourth asks what happens if nobody requests a loan: the bank's offer is a ceiling, not an obligation to borrow. A fifth asks whether a deposit protected by insurance proves the bank is solvent; it does not, because an external payer can cover a claim while bank capital remains impaired.

For a more advanced class, ask students to derive the new-credit ceiling from existing exposure. Given marked capital K , ratio k and risky assets R , additional capital-based room is $\max(0, K/k - R)$, combined with cash and the transaction ceiling. The result applies only to a provisionally solvent bank under the activity's rule. Compare that expression with the incorrect K/k used as entirely new credit while ignoring existing exposure. This exercise connects a familiar ratio with a concrete lending decision and identifies its denominator explicitly.

4.5 Data and episode reconstruction

The custom download is long, with one row per person and technical round. It includes session, participant code, language, edition, treatment, matching, group, role position, outcome and economy state. State appears once per group and round to avoid nine unnecessary copies. It contains choices, balances, liquidation paths, policies, output and sequential events. This is private instructor information. Participant screens receive only the elements authorized for their role and condition, rather than the complete stored state.

All ten technical rounds remain in the download even for one interaction. Active rounds may be complete or pending; others are inactive. An outcome not yet generated stays empty. The native download is wide, with one person row and round columns. Both buttons refer to the selected session. Before combining records, retain condition, rule version, date and whether observations came from practice or class. Do not present a technical demonstration as evidence of human behavior. A complete file structure can include legitimate empty values without being a failed export.

Reconstruction reapplies choices from opening resources, maintains a common price and follows priority. Every obligation needs a counterpart and every external account must enter consolidation. Replay must reproduce the same stored state and zero-cent discrepancy, including the reference projection used by participant screens. Price-calculation events are a mechanical solution rather than new choices. The authority's score remains separate and cannot be used to close a monetary identity. These checks make it possible to locate the source of a difference instead of silently adjusting a residual.

Codes identify technical records and are not public names. Store files with appropriate permissions and share aggregates. Using classroom data for research requires a separate protocol; this guide

does not claim ethics approval or consent for additional purposes. Do not automatically merge trajectories with grades or personal information. Absence of demographic questions reduces unnecessary collection but does not remove the obligation to protect individual decisions. Preserve raw files before preparing classroom summaries so that any subsequent transformations can be explained.

4.6 Troubleshooting and operational completion

For a rejected borrowing or contribution choice, inspect role limits, resources and margin. Monetary inputs use whole ECU and sales use 0.01-unit steps. For public support, check enabled tools and collateral eligibility as well as total budget. Large fiscal reserves do not make a provisionally insolvent bank eligible for a loan. New firm capacity can be below 200 because of capital or cash, and the manager's actual offer can be lower still. Check the correct stage before interpreting a displayed zero.

For a wait that does not advance, verify that all nine trajectories belong to the same session and every required function has completed the stage. Do not reset the database to fix a wait. Restarting the process preserves sessions; replacing the database invalidates personal links. A missing-user message commonly means an old link or another instance. Locate the correct session or create a new one before distributing current links. Do not manufacture choices to complete an economy or reuse one person's link for another role halfway through a session.

For an apparently empty report, inspect session selection and completed-episode count. The administrator may open it from a later technical round; implementation explicitly gathers active rounds from the first. A pending account is not zero. If consolidated discrepancy were nonzero, do not use that episode for teaching conclusions until reconstructing it. Preserve evidence and correct the affected branch without repeating equivalent configurations. After a text correction, inspect the changed screen rather than rerunning every economic calculation that already passed.

Attention

Do not share authenticated reports, delete the database during class or fill in missing choices. Preserve current links when refreshing the server. Check public publication separately from local operation and distinguish software verification from a student pilot.

Operational closing means confirming final screens, downloading both formats, recording the condition and reviewing denominators. Conceptual closing asks who absorbed each loss and which link connected markets to output. The activity remains useful when people avoid leverage or a constraint turns out irrelevant: those outcomes identify conditions activating a mechanism. They should not be removed to preserve a predetermined crisis narrative. A strong transfer answer traces an explicit claim and restriction rather than using a general financial label in place of an explanation.

4.7 Bibliographic foundation and adaptation

[Brunnermeier and Pedersen \(2009\)](#) studies links between market and funding liquidity; [Bernanke and Gertler \(1989\)](#) connects balance sheets and fluctuations through financial frictions; [Diamond and Dybvig \(1983\)](#) provides a foundation for distinguishing intermediation and withdrawals. These sources support related mechanisms. They are not an exact recipe for the nine roles, parameters, iterative price or intervention tools in this activity. No empirical result or human learning gain is attributed to the software tests.

The integration is an original teaching design combining verified laboratory components and explicit simplifications: two banks, one deposit representative per bank, one security, mechanical depth, linear output and published priority. It neither recreates a historical crisis nor estimates an optimal regulation. Official oTree documentation supports groups, pages and exports. Technical validation establishes operation and accounting; a later pedagogical pilot should measure comprehension and duration separately. Retain the published rule version before changing parameters so that comparisons across classes remain interpretable.

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