Money and Banking

Student reference and activity book



Promises, choices, and the people behind finance

Materials customized by Jason Javarone for use in the St. Mary's School Money and Banking course.

1 introductory meeting • 22 core lessons • 3 flexible meetings

MEETING 1 • INDUSTRY INTRODUCTION AND DISCUSSION

Inside the banking industry

Mr. Javarone described his work in finance and introduced the distinction between commercial and investment banking. A business might borrow from a commercial bank or ask an investment bank to help it sell bonds to investors. Who lends the money in each case?

Most classes begin with a story. Some describe actual events. Others use invented people and simple numbers so the decisions are easier to see. Look for the assumptions that make each arrangement useful and the conditions under which it could fail.

At Meeting 2, turn to page 6. We will read Lesson 1, “Money as a usable promise,” together. After class, read only the READ page for Lesson 2 on page 10 for Meeting 3. Allow three to five minutes and consider its closing question. There is nothing to turn in.

Use the activity pages to calculate, sketch, and record the reasons for your choices. These pages are yours. You may change your mind after hearing another student’s explanation.

> **SIX QUESTIONS TO KEEP ASKING**
>
> Who owes what to whom? Who gets paid, and for what? Who bears the loss? What assumptions make the arrangement work? What changes under stress? What tradeoffs follow from the proposed solution?

READ prepares you. EXPLAIN develops the idea. TRY gives you space to work. REFLECT brings you back to the question. CHECK points to an assumption worth examining.



COURSE NAVIGATION

Contents

Meeting 1 • Industry introduction and discussion / p. 2

Lessons 1-22 are planned for Meetings 2-23. Meetings 24-26 are flexible. If a guest visit or discussion moves a class, use the lesson number to find your place.

LESSON / TOPIC PAGE

01 Money as a usable promise 6

Meeting 2 • Unit 1 • Why would anyone accept a claim instead of the thing they ultimately want?

02 A bank makes a loan 10

Meeting 3 • Unit 1 • What changes when a bank approves a loan and the borrower spends it?

03 Capital is not cash 14

Meeting 4 • Unit 1 • Can a bank own more than it owes and still be unable to pay today?

04 A run on a bank 18

Meeting 5 • Unit 1 • How can many individually sensible withdrawals make everyone less secure?

05 Why a bond price changes 23

Meeting 6 • Unit 2 • Why can a fixed promise lose market value without a missed payment?

06 Inflation and real returns 27

Meeting 7 • Unit 2 • If your account grows, are you necessarily better able to buy things?

07 Overnight money and the Fed 31

Meeting 8 • Unit 2 • How can the price of money for one night affect a loan that lasts years?

08 Insurance and expected value 36

Meeting 9 • Unit 3 • Why pay more for insurance than the average loss it covers?

09 Diversification under stress 40

Meeting 10 • Unit 3 • Does owning more investments always mean taking less risk?

10 Leverage and forced selling 44

Meeting 11 • Unit 3 • Can you forecast the final price correctly and still lose money?

11 Options and asymmetric payoffs 48

Meeting 12 • Unit 3 • Can you limit a loss and still gain if the price rises?

COURSE NAVIGATION

Contents, continued

LESSON / TOPIC PAGE

12 Funding a new business 53
Meeting 13 • Unit 4 • What does a founder give up when someone else supplies the money?

13 Financing a project 57
Meeting 14 • Unit 4 • Can contracts make an uncertain project easier to finance?

14 Buying a company with debt 61
Meeting 15 • Unit 4 • Does a higher equity return mean the buyer improved the business?

15 From mortgages to securities 66
Meeting 16 • Unit 5 • How can one home loan become part of someone else's investment?

16 Who takes the first loss? 70
Meeting 17 • Unit 5 • Can risky loans support a safer claim without making every claim safe?

17 When overnight lenders leave 74
Meeting 18 • Unit 5 • How can financing disappear before the underlying loans reach their final outcome?

18 2008: intervention and tradeoffs 78
Meeting 19 • Unit 5 • When should protecting the financial system involve helping a failing institution?

19 A trade that should converge 83
Meeting 20 • Unit 6 • Can a sensible forecast become a losing trade before it comes true?

20 LTCM: surviving until convergence 87
Meeting 21 • Unit 6 • Why might several sensible individual exit decisions create a system-wide problem?

21 Enron: earnings, cash, and trust 91
Meeting 22 • Unit 6 • What would you ask before trusting an impressive profit figure?

22 Design a system that can withstand stress 95
Meeting 23 • Unit 6 • Which risks should a useful financial system accept, and how should it prepare for failure?

After the lessons

Bond-price graph 99
Option profit graphs 100
Glossary 101
Guest speaker notes 105
Questions and connections 106
Sources and further reading 107

UNIT 1 • LESSONS 01-04 • MEETINGS 2-5

Money, banks, and trust

At a school fair, visitors buy tickets at one cash-and-change booth, then use them at soup, bicycle-repair and portrait stalls. What makes stallholders willing to accept the tickets? We will follow the promises that make payments possible, then see what changes when a bank makes those promises.



Would you take a ticket for a bowl of soup? It depends on who else will accept the ticket.

The lessons ahead

01. Money as a usable promise
02. A bank makes a loan
03. Capital is not cash
04. A run on a bank

Questions to carry into class

- What would make you willing to accept a ticket or a deposit as payment?
- How is having valuable assets different from having cash ready today?

R LESSON 01 • MEETING 2 • UNIT 1 • READ / IN-CLASS READING

Money as a usable promise

Why would anyone accept a claim instead of the thing they ultimately want?

Imagine a small, fictional school fair. One student sells soup, another repairs bicycles, and a third runs a portrait booth. The organizers want one booth to handle cash and make change. Stallholders agree to accept tickets if that booth will redeem them for dollars. What convenience does that buy the stalls, and what new risk do they take?

The organizers introduce transferable tickets. A visitor buys tickets with dollars, stalls accept them for goods and services, and holders can redeem them for dollars through closing. A ticket is a claim: its holder has a stated right against the organizer. The organizers must keep that promise. A colorful piece of paper alone cannot guarantee payment.

Within the fair, the tickets act as a medium of exchange because participants accept them in payment. Quoting soup at four tickets makes the ticket a unit of account, a common measuring unit for prices. Keeping tickets until later makes them a temporary store of value. Their usefulness still depends on redemption and on what they can buy.

Real economies use several forms of money. A bank deposit is a claim on a bank; a debit card is a way to instruct a payment, not another pile of money. Wealth is broader: it includes valuable assets after subtracting debts. In this course, we will ask who owes what, who benefits, and who bears a loss. If a rumor says the fair cannot redeem its tickets, what evidence would make you continue accepting them?

No advance preparation needed. Begin here together in class.

E LESSON 01 • MEETING 2 • EXPLAIN

How it works

Money as a usable promise

A financial claim describes a relationship between parties. A deposit is an asset for the customer who can use it and a liability for the bank that owes it. The same claim therefore appears from two perspectives. This is not double wealth: one person's right to receive is another person's obligation to deliver. A payment changes who holds a claim or settles an obligation.

Money and the method used to move money are different. In a debit-card purchase, the card gives instructions that ultimately reduce one bank balance and increase another, after payment processing. A credit-card purchase instead creates or increases a borrowing obligation for the buyer. An app balance might be a bank deposit or another kind of claim; the legal arrangement matters more than the screen design.

The fair illustrates how shared acceptance can reduce the need to match wants directly. It is a teaching model, not a claim that every historical monetary system began with barter. Tickets work only within their rules. A ticket accepted at three stalls may be useful there while being useless at a grocery store. Acceptance also depends on reliable records and the ability to transfer ownership without creating duplicate claims.

If the organizer holds one redeemable dollar for each outstanding ticket, selling tickets exchanges one form of purchasing power for another; it does not create additional goods or net wealth. When a ticket changes hands, the organizer's total obligation stays the same. When a ticket is redeemed and canceled, both the organizer's cash and outstanding ticket obligation fall. These small bookkeeping facts become the foundation for understanding banks.

One claim, several viewpoints

Event	Organizer cash	Tickets owed
Sell 60 tickets	$60	60
20 tickets change hands	$60	60
Redeem and cancel 15	$45	45

Original hypothetical model. One ticket is redeemable for $1; there are no fees or expenses.

Sources: S01, S02.

T LESSON 01 • MEETING 2 • TRY / 15 MINUTES

Design the fair payment system

Pairs, followed by a whole-class decision

At a fictional one-day fair, the organizer sells 100 tickets for $1 each. Every stall accepts them. Holders can redeem tickets for $1 each at any time through closing. Each redeemed ticket is canceled. Visitors spend 40 tickets at the soup stall and 30 at the portrait booth, keeping the rest. The soup stall redeems 25 tickets. The organizer has no other assets, debts, income, or expenses. Start by counting each ticket wherever it is now. In the second question, assume the decorations are used up during the fair and have no resale value.

L01.A1 After the sales and the 25-ticket redemption, identify the organizer’s cash and total outstanding tickets. Show how the remaining tickets are distributed.

L01.A2 The organizer now spends $20 of its cash on decorations without canceling tickets. How much cash remains, and what is the shortfall if everyone redeems?

L01.A3 Recommend one rule that would make tickets more trustworthy and explain its cost or limitation. Would you personally accept a stranger’s 10-ticket IOU instead? Why?

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 01 • MEETING 2 • REFLECT

Return to the question

Money as a usable promise

Worked example • A stall spends its tickets

Return to the 60-ticket example. The organizer has $45 and 45 tickets remain after redemption. A stall now spends 5 of its tickets at the portrait booth.

The portrait booth gains 5 tickets and the spending stall holds 5 fewer.

No tickets were redeemed. The organizer still holds $45 and owes $45 on 45 tickets.

A new holder changes the ownership record. The organizer’s cash and total obligation stay the same.

In the fair model, a ticket succeeds because users understand who stands behind it, how it can be transferred, and what redemption means. The numerical record is as important as the promise. After an organizer spends backing money while leaving tickets outstanding, the same number of claims competes for fewer dollars. Trust can be damaged by an actual shortfall or by uncertainty about the records.

The lesson is broader than paper tickets. For any balance on a screen, ask what legal claim it represents and how payment is completed. A useful system also needs security and clear procedures when someone makes a mistake. Those arrangements can make exchange easier, but they cost resources. Money is a tool for coordinating transactions; it should not be confused with the total productive wealth of a community.

Discuss

- Does a trusted payment system create value even if it creates no additional soup or photographs?
- Why might a seller accept a payment claim that cannot be used everywhere?
- What evidence is stronger than the organizer simply saying the system is safe?

TAKEAWAY To understand a payment, identify the claim, the party responsible for honoring it, and the records that change. A convenient method of payment is not automatically a separate form of wealth.

CHECK Seeing a dollar amount in two places does not necessarily mean two independent assets have been created. The fair’s cash backs an obligation to ticket holders; ignoring that obligation overstates the organizer’s wealth.

R LESSON 02 • MEETING 3 • UNIT 1 • READ / BEFORE THIS LESSON

A bank makes a loan

What changes when a bank approves a loan and the borrower spends it?

Imagine a fictional bicycle shop that needs a new repair stand. Its owner asks River Bank for a $2,000 loan. After approving the loan, the bank credits the owner’s checking account with $2,000. The shop now has money it can spend. It also owes $2,000. The transaction has created a deposit and a debt, not an automatic increase in the shop owner’s net wealth.

An asset is something a person or institution owns, including a claim to future payment. A liability is something it owes. From the bank’s perspective, the shop’s promise to repay is an asset. The new deposit is a liability because the bank must honor the customer’s payment instructions. These two entries appear together. In this example, River credited the borrower without debiting another customer’s deposit.

Spending the deposit creates another problem for the bank. Suppose the equipment seller uses Mountain Bank. River Bank must arrange payment to that other bank. Banks can settle such payments using reserves, balances held at the central bank. A deposit that a household holds at a commercial bank is different from the reserves the commercial bank holds at the central bank. The household normally spends its deposit, not a reserve balance.

Creating an entry on a screen therefore does not give a bank unlimited freedom. It must meet settlement obligations, absorb possible credit losses, satisfy applicable rules, and earn enough to cover funding and operating costs. A borrower who cannot repay is not a profitable customer simply because the bank can type a balance. Lending depends on both the willingness of customers to borrow and the bank’s ability to manage the resulting risks.

If the borrower later repays part of the amount borrowed (the principal) from a deposit at the same bank, both that deposit and the outstanding loan decrease. Principal repayment is different from interest, which is income to the lender before its costs. We will keep interest separate in the classroom ledger. If the shop pays the entire $2,000 to a seller at Mountain Bank, what happens to River’s reserves? Does the shop still owe River $2,000?

No written response required. Bring your initial judgment to the discussion.

E LESSON 02 • MEETING 3 • EXPLAIN

How it works

A bank makes a loan

Reset to a separate River Bank example. Begin with a bank balance sheet: assets = liabilities + equity. In the simplified ledger, assets include reserves and loans; liabilities include customer deposits; equity is the residual claim of the owners. A new $4,000 loan recorded at its full value adds $4,000 to loans and $4,000 to deposits. Equity does not increase merely because the loan is booked. This example ignores initial fees and provisions to isolate the transaction.

Now suppose the borrower pays $3,000 to a seller at another bank. The lending bank reduces the borrower's deposit by $3,000 and sends $3,000 in reserves. The receiving bank gains $3,000 of reserves and credits its seller's deposit by $3,000. Across these two banks, total reserves are unchanged, although their location changes. The new loan remains outstanding: spending is not repayment.

A bank short of settlement funds has to obtain funding, sell suitable assets, or use an available borrowing facility under its terms. No classroom entry entitles it to unlimited central-bank lending. New deposits are useful funding, but customers may transfer them elsewhere. Credit risk and settlement needs are connected, yet they are not the same problem. An excellent borrower can still spend money at another bank.

For repayment at the lending bank, subtract principal from both the customer's deposit and the loan asset. If a customer repays from another bank, a reserve transfer also occurs. The accounting is slightly longer but the economic distinction remains: principal repayment reduces the debt; a payment to a supplier does not. Use the ledger to identify each change rather than memorizing that all movements of money are identical.

River Bank ledger: worked example

Stage	Assets	Deposits + equity
Start	10,000 reserves + 40,000 loans	45,000 + 5,000
After loan	10,000 reserves + 44,000 loans	49,000 + 5,000
After payment	7,000 reserves + 44,000 loans	46,000 + 5,000

Dollars; original hypothetical example. No fees, loan losses, interest, or other transactions.

The borrower pays a seller at another bank



Sources: S03, S01.

T LESSON 02 • MEETING 3 • TRY / 15 MINUTES

Follow the loan through two banks

Pairs; each partner checks one side of the ledger

Use dollars throughout. Fictional Pine Bank begins with reserves of $20,000 and loans of $80,000. It owes depositors $90,000 and has equity of $10,000. It grants a new $12,000 loan by crediting a new borrower's deposit. The borrower then pays $9,000 to a supplier whose account is at Cedar Bank; settle this payment with reserves. Finally, the borrower repays $2,000 of principal using the money remaining in the Pine Bank deposit. Assume no interest, fees, losses, other transactions, or additional reserve borrowing. Cedar Bank's starting totals are not needed; record only its changes.

Complete Pine's balances in dollars. Assets = deposits + equity. Record Cedar's changes separately below.

Pine Bank	Reserve balances	Loans	Total assets	Deposits	Equity
Start	20,000	80,000	100,000	90,000	10,000
A1 · Loan created					
A2 · Supplier paid					
A3 · Principal repaid					

Cedar's changes ($): reserve balances _____; deposits _____.

L02.A1 Record Pine Bank's assets, deposits, and equity immediately after the loan. Did Pine's equity increase?

L02.A2 Record Pine's totals after the $9,000 supplier payment. Record the changes in Cedar's reserves and deposits. What happened to combined reserves?

L02.A3 Record Pine's final totals after the $2,000 principal repayment. How much of the loan and borrower's deposit remain? Explain why paying the supplier and repaying the loan are different.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 02 • MEETING 3 • REFLECT

Return to the question

A bank makes a loan

Worked example • A $4,000 loan followed by a payment

Hypothetical River Bank begins with reserves $10,000, loans $40,000, deposits $45,000, and equity $5,000.

Make a $4,000 loan: loans become $44,000; deposits become $49,000.

The borrower pays $3,000 to another bank: reserves become $7,000; deposits become $46,000.

Check: assets $51,000 = deposits $46,000 + equity $5,000.

River Bank has more loans but fewer reserves than at the start. Its equity is unchanged.

Pine Bank's new loan initially expands both its assets and its obligations. When the borrower pays the outside supplier, reserves leave Pine and arrive at Cedar. The loan is still owed to Pine. A later principal repayment reduces the loan and the borrower's remaining deposit together. These are three distinct transactions with three different effects.

The useful service is financing a purchase before the borrower has earned all the necessary cash. The risks include whether the borrower will repay and whether the bank can meet payment demands. Creating a spendable deposit is neither creating a free gift nor printing physical currency. A credible explanation must follow the liabilities and settlement needs alongside the new asset. The next lesson examines the difference between surviving a loss and finding money to make a payment today.

Discuss

• If a bank can create a deposit, why does it still compete to attract depositors?

• Would a loan to a successful business necessarily increase the borrower's wealth immediately at origination?

• Pine's loan balance is $2,000 smaller. What entries would show that the customer paid principal from a Pine account? How would entries differ if Pine forgave $2,000 of a fully valued loan?

TAKEAWAY A bank loan can create a deposit, but lending also creates an obligation and exposure to losses. Spending that deposit may require reserves; principal repayment reduces the debt instead of merely transferring ownership.

CHECK A reserve balance is not the same account as a household's bank deposit. Nor does creating a deposit create equity for the bank. The bank must manage funding, credit risk, and applicable constraints after recording the loan.

R LESSON 03 • MEETING 4 • UNIT 1 • READ / BEFORE THIS LESSON

Capital is not cash

Can a bank own more than it owes and still be unable to pay today?

Picture a fictional family that owns a house worth $400,000 and owes $250,000 on its mortgage. Ignoring all other assets and debts, it has $150,000 of net worth. That does not mean it has $150,000 available to buy groceries today. Much of its value is tied up in a house. Selling or borrowing against that house takes time, involves costs, and may require a willing buyer or lender.

Banks face a related distinction. Liquidity means the ability to meet payments as they become due. Cash and reserves are highly liquid; a loan that will be repaid over several years usually cannot be turned into its full expected value instantly. Capital, in our simplified examples, means equity: the difference between the value of assets and the liabilities owed to others. It provides room to absorb losses.

Suppose a bank has assets worth $500,000 and liabilities of $460,000. Its equity is $40,000. If a borrower defaults and the bank permanently loses $15,000 of value, equity falls to $25,000. The bank cannot solve that loss just by rearranging the remaining assets. If it borrows $15,000, it obtains cash but also creates a new $15,000 liability. Borrowing changes liquidity, not the missing net worth.

A bank may have positive equity while temporarily lacking payment funds. Conversely, it may have cash on hand while its total assets are worth less than its debts. Solvency asks whether asset value is sufficient to cover liabilities. Liquidity asks whether obligations can be met on time. The distinction is useful, but it is not a wall between unrelated problems.

If a bank must sell valuable loans quickly at a discount, its cash position can improve while its equity shrinks. The price it receives may depend on how urgently it must sell. Outsiders may disagree about what its assets are really worth. Before accepting a claim that a bank is safe, ask what evidence supports both its asset values and its access to funds. Suppose you could lend the bank enough to make today’s payment. What would you want to know before saying yes?

No written response required. Bring your initial judgment to the discussion.

E LESSON 03 • MEETING 4 • EXPLAIN

How it works

Capital is not cash

For these lessons, calculate equity E as assets A minus liabilities L: E = A - L. This is a simplified economic balance sheet, not a complete regulatory capital calculation. State how assets are valued. A loan’s face amount is what the borrower owes; its economic value depends on expected repayment and timing. An accounting entry does not make an uncollectible loan valuable.

A withdrawal paid at full value lowers both a bank’s liquid assets and its deposit liabilities by the same amount. Equity is unchanged. By contrast, recognizing a loan loss lowers assets without lowering the amount owed to depositors, so equity falls. The two transactions can both make managers uncomfortable while affecting the balance sheet differently. Watch the entries rather than treating every cash movement as an expense.

Borrowing $10,000 raises assets by $10,000 and liabilities by $10,000. An owner contributing $10,000 in exchange for newly issued equity raises assets and equity instead. Both bring in cash; only the owner contribution directly increases the loss-absorbing cushion. The terms matter: money provided as a loan is not interchangeable with money provided as ownership capital.

Forced asset sales connect liquidity and solvency. Suppose loans worth $20,000 in the original balance sheet fetch only $16,000 in an urgent sale. Loans fall $20,000, cash rises $16,000, and equity falls $4,000. The sale provides cash but creates or recognizes a loss. Whether the original valuation was realistic is a separate question. Good analysis must state both the cash raised and the value surrendered.

What changes equity?

Separate event	Assets change	Liabilities change	Equity change
$12,000 loan loss	-$12,000	$0	-$12,000
$12,000 withdrawal	-$12,000	-$12,000	$0
$12,000 borrowing	+$12,000	+$12,000	$0
$12,000 owner investment	+$12,000	$0	+$12,000

Original hypothetical transactions. Owner investment means newly contributed funds, not an investor buying existing shares from another investor.

Sources: S04, S03.

T LESSON 03 • MEETING 4 • TRY / 15 MINUTES

Three banks, three diagnoses

Pairs, then compare diagnoses with another pair

All amounts are in thousands of dollars. Use these simplified economic values, with no taxes, fees, or other assets and debts. Bank A has cash 8, loans worth 92, and deposits 90. Bank B has cash 30, loans worth 65, and deposits 100. Bank C has cash 20, loans worth 100, and deposits 100. A must meet withdrawals of 15 today; assume it cannot immediately borrow or sell loans. Evaluate B's borrowing proposal independently. Evaluate C's sale independently from A and B: C can sell loans currently valued at 25 for cash of 20. No withdrawal follows C's sale.

Record each independent case in thousands of dollars. Total assets = cash + loans; equity = assets − deposits − other debt.

Bank / stage	Cash	Loans	Total assets	Deposits	Other debt	Equity
A · Initially						
B · Initially						
C · Initially						
B · After borrowing						
C · After sale						

L03.A1 Find total assets and equity for A, B, and C. Which bank has a solvency problem at these values? What immediate problem does A face?

L03.A2 B borrows 10 in cash from another lender. Find its new assets, liabilities, and equity. Has borrowing fixed its solvency problem?

L03.A3 C makes the proposed loan sale. Find its cash, remaining loans, total assets, and equity. What payment could C now make that its original cash could not cover? At the stated values, what does the sale cost its owners? Name one fact to check before recommending it.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 03 • MEETING 4 • REFLECT

Return to the question

Capital is not cash

Worked example • A loss and a withdrawal are different

Hypothetical bank: liquid assets $30,000, loans $170,000, deposits $180,000, equity $20,000. Treat each scenario separately.

A $12,000 loan loss leaves assets $188,000 and equity $8,000.

A $12,000 withdrawal leaves assets $188,000 and deposits $168,000; equity stays $20,000.

Borrowing $12,000 adds an asset and an equal liability; equity stays $20,000.

Equal dollar amounts need not have equal effects on capital.

The activity separates three diagnoses. A has positive equity but insufficient cash for the specified immediate withdrawal. B has plenty of cash relative to some possible payments, yet assets are worth less than liabilities. C can raise cash by selling loans, but the discount reduces its capital cushion. The categories help identify what a proposed remedy actually accomplishes.

They also show why one reassuring number is not enough. A large cash balance does not prove economic solvency. Positive equity at the stated asset values does not prove the ability to meet withdrawals. For any rescue plan, ask whether it supplies liquidity, absorbs losses, changes the valuation of assets, or does more than one of these. Next we examine how many individually reasonable withdrawal decisions can combine into a run on a bank.

Discuss

• Why could two analysts disagree about solvency even when they agree on the amount owed to depositors?

• When does a temporary borrowing arrangement help, and when can it delay recognition of a loss?

• Why might an investor require different compensation for a loan and an ownership investment?

TAKEAWAY Liquidity concerns payment timing; equity concerns the value available to absorb losses. Borrowing, owner investment, withdrawals, and loan losses have different effects even when their dollar amounts are identical.

CHECK Capital is not a separate vault of cash waiting to be spent. In these examples it is the difference between assets and liabilities. A bank can have substantial equity invested in assets that cannot be sold quickly at full value.



R LESSON 04 • MEETING 5 • UNIT 1 • READ / BEFORE THIS LESSON

A run on a bank

How can many individually sensible withdrawals make everyone less secure?

It is the morning of March 9, 2023. Yesterday Silicon Valley Bank announced a securities sale and plans to raise capital. Your fictional company has an uninsured balance there and payroll due tomorrow. What would you do with the balance? Which fact would change your choice? You cannot value the bank's entire portfolio in a few hours. Your decision also depends on what you expect other depositors to do.

A bank run occurs when many depositors seek their money over a short period because they fear losing access or suffering losses. The bank's assets may include loans that repay over years, while its depositors can request payment much sooner. This maturity mismatch serves a useful purpose: it can finance long-lived purchases while providing convenient payment accounts. It also creates a timing vulnerability.

Suppose a bank has $10,000 in immediately available funds and loans worth $90,000. It owes depositors $95,000. At those values, assets exceed liabilities by $5,000. But if depositors demand $30,000 today, the bank needs another $20,000 of payment funds. It might borrow or sell assets. If buyers demand a discount because the sale is urgent, satisfying withdrawals can reduce the bank's equity.

Insurance can change the depositor's calculation. If a credible insurer promises to protect a covered deposit when a bank fails, the depositor has less reason to race others solely to avoid a loss. That does not make every account or investment insured, and it does not make bad loans good. Coverage, credibility, and access to funds still matter. A guarantee can also weaken the incentive to monitor risk.

In the United States, the FDIC generally insures up to $250,000 per depositor, per insured bank, per account ownership category. Several accounts in the same category at the same bank generally share one limit. Our class will use a fictional bank, Harbor, so we can see exactly what it owns and owes. Return to the payroll decision: what would make you willing to wait, and what could the bank have to sell if you and other customers all withdraw today?

No written response required. Bring your initial judgment to the discussion.

E LESSON 04 • MEETING 5 • EXPLAIN

How it works

A run on a bank

A run can begin with valid news about losses, an inaccurate rumor, or uncertainty that depositors cannot resolve quickly. It need not be purely emotional. If depositors expect others to withdraw, holding back can seem individually dangerous. Simultaneous action then increases the bank's immediate funding need. The feedback is the lesson: expectations influence transactions, and those transactions may change asset values and expectations again.

Consider the bank's options separately. Selling a liquid asset near its stated value supplies cash with little direct loss. Selling a loan at a steep discount supplies less cash per dollar of value surrendered. Borrowing can bridge a timing gap if lenders believe the bank can repay and acceptable collateral is available. Raising new equity can absorb losses but may be difficult precisely when outside investors doubt the valuation.

Deposit insurance protects eligible deposits if an insured bank fails. Shareholders still face losses, and the bank still needs funds to make payments today. Suppose you hold a checking account and a savings account solely in your name at the same FDIC-insured bank. For ordinary single-owner accounts without beneficiaries, the FDIC adds those balances together when applying the coverage limit. Opening another account in that same category does not start a second limit.

Policy has tradeoffs. Broader protection can reduce incentives to run, yet it may also encourage depositors to ignore bank risk or encourage managers to rely on protection. Requiring more capital, liquid assets, supervision, or risk-related insurance charges can address parts of that problem, but each has costs and limits. Evaluate a package of rules by its mechanisms, not by claiming that either guarantees or market discipline always work perfectly.

How the run can feed on itself

Stage	Immediate effect	Next concern
Depositors fear delay	More withdrawals requested	Can the bank pay today?
Bank sells loans urgently	Discount reduces equity	Are losses now larger?
More depositors worry	Further funding pressure	What breaks the cycle?

A possible feedback sequence, not an inevitable outcome or a historical chronology.

Sources: S04, S05, S06, S07.

T LESSON 04 • MEETING 5 • TRY / 15 MINUTES

Harbor Bank faces the queue

Groups of three: depositor, bank manager, and policy adviser

All amounts are in thousands of dollars. Fictional Harbor Bank has cash 20 and loans worth 100, owes deposits of 110, and has no other liabilities. Depositors request withdrawals of 40 today. The bank cannot borrow today. It can sell a block of loans valued at 25 for cash of 20; assume that sale is available and changes no other loan values. Harbor starts in a fictional system without deposit insurance or outside assistance. Then separately consider a credible new guarantee covering every depositor in this fictional example. The guarantee protects deposits if the bank fails, but does not give the bank immediate cash or protect its owners.

Use thousands of dollars. Show the loan sale and the depositor payment as separate stages.

Harbor Bank	Cash	Loans	Deposits	Equity
Start	20	100	110	
After loan sale				
After withdrawals				

L04.A1 Find initial equity and the cash shortfall. Explain why the initial balance sheet alone does not prove Harbor can meet the withdrawal request.

L04.A2 Complete the loan sale and pay the withdrawals. Find remaining cash, loan assets, deposits, and equity. What changed because of the sale, and what changed because of the withdrawal?

L04.A3 How might the fictional guarantee change a depositor’s decision? Identify one benefit, one possible incentive problem, and one complementary rule. Explain why the guarantee does not automatically repair the bank’s assets.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 04 • MEETING 5 • REFLECT

Return to the question

A run on a bank

Worked example • Meeting withdrawals by selling loans

Hypothetical bank has cash $15,000, loans $85,000, deposits $90,000, and equity $10,000. Withdrawals of $35,000 arrive.

Cash shortfall: $35,000 - $15,000 = $20,000.

Sell loans recorded at $25,000 for $20,000; recognize a $5,000 loss.

Before payment: cash $35,000, loans $60,000, deposits $90,000, equity $5,000.

After payment: cash $0, loans $60,000, deposits $55,000, equity $5,000.

Payments are met, but the capital cushion is halved.

Harbor meets the withdrawal only by using cash and selling loans below their stated value. Paying withdrawals reduces deposits but does not reverse the sale loss. For a separate U.S. coverage check, one person has $180,000 in checking and $120,000 in savings, both single-owner accounts with no beneficiaries at the same FDIC-insured bank. How much is covered under the standard rule?

More than $40 billion left SVB on March 9. Management expected another $100 billion to leave the following day. Regulators closed the bank on March 10. On March 12, the government announced that all SVB depositors could access their funds starting March 13. The fictional payroll officer did not know that outcome on March 9. Compare that exceptional protection with the ordinary coverage rule.

Discuss

- Could a withdrawal be reasonable for one depositor while harmful when many people do it together?
- When would a lender hesitate to provide emergency funds to a bank with apparently positive equity?
- What would you need to know to distinguish an unfounded rumor from a justified warning?

TAKEAWAY A bank run links individual decisions to collective funding pressure. Insurance can reduce that pressure, but payment access, asset quality, loss allocation, and incentives must still be examined separately.

CHECK Deposit insurance is not unlimited protection for every financial product or every dollar at a bank. It also does not protect shareholders from losses. The classroom guarantee is intentionally broader than the actual standard FDIC coverage rule.

UNIT 2 • LESSONS 05-07 • MEETINGS 6-8

Interest rates and the Federal Reserve

A promise to receive money next year has a price today. That price depends on the alternatives available to the buyer. We will connect this idea to bond trading, purchasing power, and the overnight borrowing that helps banks complete their payments.



Illustration of a 1980s trading room: telephones, paper records, and computer terminals.

The lessons ahead

05. Why a bond price changes

06. Inflation and real returns

07. Overnight money and the Fed

Questions to carry into class

- Why would the price of a fixed future payment change?
- When does earning more dollars mean being able to buy more?

R LESSON 05 • MEETING 6 • UNIT 2 • READ / BEFORE THIS LESSON

Why a bond price changes

Why can a fixed promise lose market value without a missed payment?

In 1982, U.S. savings and loan institutions, also called thrifts, faced a squeeze. They took deposits and financed home mortgages. The GAO later reported that the industry paid an average of just over 11% on borrowed funds and earned just under 11% on its mortgage portfolio. Even a performing old mortgage could earn less than the lender's new funding cost. What would a buyer offer for it? Consider a simpler promise of $110 in one year. At a $100 price its return is 10%.

If comparable investments now offer a 20% return, paying $100 for your $110 promise gives the buyer too little return relative to the alternative. Your promised payment has not changed. The price someone will pay for it can change. At a price of approximately $91.67, the $110 payment provides a 20% return. The adjustment occurs through today's price, not by rewriting the original promise.

A bond is a debt security: a claim on payments from a borrower. Many bonds promise regular interest payments, called coupons, and repayment of face value at maturity. To isolate the logic, our first examples use only one future payment. A required yield is the rate of return a buyer demands for the payment's timing and risk. A higher required yield means the buyer must pay less for an unchanged future payment.

Present value is the amount today equivalent to a future payment at a stated discount rate. If P is today's price, F is a payment one year away, and r is the required annual return as a decimal, $P(1 + r) = F$. Dividing gives $P = F/(1 + r)$. This is the same compound-growth relationship read backward. Discounting does not mean the borrower plans to pay less.

The words comparable and unchanged matter. Default risk, inflation expectations, time until payment, and other features can also influence prices. A government guarantee of promised payments does not guarantee the price an investor receives when selling early. Our numerical interest rates are hypothetical and are not current market quotes. If you will need cash tomorrow, why might owning a reliable payment due several years from now still expose you to a loss?

No written response required. Bring your initial judgment to the discussion.

E LESSON 05 • MEETING 6 • EXPLAIN

How it works

Why a bond price changes

For a single payment one year away, calculate return as (F - P)/P. The denominator is what the buyer invests, not the future payment. With F = $110 and P = $100, return is $10/$100 = 10%. With the same F and P = $91.67, return is approximately 20%. The higher yield and lower price describe the same transaction from different angles.

For a single payment n years away, annual compounding gives $P = F/(1 + r)^n$. Here r is an annual effective required return, assumed constant for this simple calculation. Market discount rates can differ by maturity. A coupon bond has several future payments, so its price is the sum of their present values. We do not need a long formula to see why each fixed payment is worth less today at a higher discount rate.

Keep the comparison at the same valuation date. Otherwise, a price change could reflect both a new yield and the passage of time. Longer-dated single-payment claims are more sensitive in percentage terms to the same yield change, because more periods of discounting are affected. This is interest-rate risk, separate from the risk that the borrower fails to pay.

A higher market yield immediately reduces the value of fixed future payments. Selling at that new value realizes the loss from original cost. Holding preserves the promised payments but still requires funding. A thrift may need cash for withdrawals or pay more to keep deposits. These pressures help explain early thrift distress. Later changes in supervision, regulation and risk-taking also shaped the wider crisis.

One promise, different required returns

Payment in one year	Required return	Price today
$525	0%	$525.00
$525	5%	$500.00
$525	12%	$468.75

Original hypothetical single-payment claims. Rates change at the same valuation date; payment risk is held constant.

Sources: S08, S09, S10. Bond-price graph, p. 99.

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LESSON 05 • MEETING 6 • TRY / 15 MINUTES

The buyer changes the price

Pairs; calculator allowed

A hypothetical transferable debt claim will pay $1,080 exactly one year from today and nothing before then. Assume certain payment, no fees or taxes, and annual compounding. Its current required return is 8%. Now imagine an immediate change in comparable required returns to 20%, with no time passing and no change in the promised payment. For comparison, a second claim pays $1,166.40 exactly two years from today and nothing before then. It also initially has an 8% annual required return, which changes immediately to 20%. These deliberately large hypothetical changes make the arithmetic visible; they are not forecasts or historical market data.

L05.A1 Find the first claim’s price at 8% and at 20%. Verify the buyer’s return at the new price.

L05.A2 An investor bought the first claim at its 8% price just before the change and must sell immediately. Find the dollar and percentage loss. What happens instead if the investor holds until payment under the stated assumptions?

L05.A3 Price the two-year claim at 8% and at 20%. Compare its percentage price decline with the one-year claim. Explain the role of payment timing.

L05.A4 A bank funds long-term fixed-rate claims with deposits that may leave tomorrow. Identify the two separate problems that a rate increase could create, even if borrowers keep making payments.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 05 • MEETING 6 • REFLECT

Return to the question

Why a bond price changes

Worked example • Price a payment backward

Hypothetical, certain payment of $525 one year from today. Ignore taxes and fees; compare at the same instant.

At 5% required return: P = 525/1.05 = $500.

At 12% required return: P = 525/1.12 = $468.75.

Check the second return: (525 - 468.75)/468.75 = 0.12.

The required return rises while the fixed future payment stays $525, so the price falls $31.25.

The one-year claim loses $100 in market value when the required yield rises. The investor who paid $1,000 and holds to maturity still receives $1,080. From today's $900 price, however, keeping the claim earns 20% over the coming year. Selling it now and reinvesting the $900 at 20% also produces $1,080. The original 8% return and the new 20% return use different starting values. Which one matters depends on the decision you are making.

The two-year claim falls more because the higher discount rate applies to its only payment for two years. For a savings and loan, waiting for promised mortgage payments required funding through the waiting period. A higher cost of retaining deposits could hurt earnings even before the institution sold a mortgage. Distinguish the decline in asset value, the income earned over time, and the cash needed to pay a depositor today.

Discuss

• Does an early-sale loss prove that the issuer broke its promise?

• Why might holding to maturity be an unavailable solution for someone with near-term obligations?

• If a bank avoids selling an asset, has every economic consequence of a higher market yield disappeared?

TAKEAWAY The price of a fixed future payment falls when its required yield rises, holding other factors constant. Reliable repayment does not guarantee a stable resale price or a good match for immediate obligations.

CHECK A bond's coupon rate and its buyer's yield are not interchangeable. Yield depends on the price paid and the full payment schedule. A fixed coupon does not prevent the market price from changing.

R LESSON 06 • MEETING 7 • UNIT 2 • READ / BEFORE THIS LESSON

Inflation and real returns

If your account grows, are you necessarily better able to buy things?

Imagine that you are saving for a bicycle. You have $500, and the bicycle also costs $500. You leave the money in an account for a year and receive 4% interest, bringing your balance to $520. Meanwhile, the bicycle price rises to $530. Your account statement shows a gain, but you can no longer buy the bicycle without adding money. This hypothetical example separates a dollar amount from what those dollars can purchase. Both measurements are useful, but they answer different questions.

A nominal value is measured in the dollars used at the time. Your $520 balance is a nominal amount. A real value adjusts for changes in prices, allowing a comparison of purchasing power. For a single purchase, the bicycle price is the relevant comparison. Economists also use price indexes that follow a broad basket of goods and services. Inflation is an increase in the general price level over a period. One bicycle becoming more expensive does not, by itself, establish economy-wide inflation.

The bicycle became 6% more expensive while the account increased 4%. Subtracting the two percentages suggests a loss of purchasing power of about 2%. For an exact comparison, divide the money growth factor by the price growth factor: 1.04 divided by 1.06 is about 0.9811. Your balance now covers about 98.11% of the price of one bicycle, a decrease of about 1.89% in purchasing power measured against that purchase. Subtraction is a convenient approximation when the percentages are modest.

Inflation also changes the meaning of a promise to repay a fixed number of dollars. A lender who expects prices to rise may demand compensation in the interest rate. Unexpected inflation can reduce the purchasing power of a fixed repayment. That does not guarantee that the borrower benefits overall: wages may fail to keep up, other costs may rise, and the borrower may struggle to make payments.

Before class, keep the bicycle story in mind. A useful comparison requires a starting date, ending date, and relevant price measure. Forecast inflation and inflation that actually occurs are different information. For a saver planning to buy this bicycle, which measure answers whether the goal is closer? Name a different goal for which the dollar balance would matter.

No written response required. Bring your initial judgment to the discussion.

E

LESSON 06 • MEETING 7 • EXPLAIN

How it works

Inflation and real returns

For one period, let i be the nominal return and p the inflation rate, written as decimals. The exact real return is (1 + i)/(1 + p) - 1. This compares two growth factors rather than subtracting two dollar amounts. If a balance grows by 8% while the relevant price level grows by 5%, purchasing power grows by 1.08/1.05 - 1, or about 2.86%. Subtracting p from i gives the 3% approximation. Specify which calculation you use.

A price index makes prices at different dates comparable. If an index rises from 100 to 108, prices in that measured basket have increased 8%. Divide a later dollar amount by 1.08 to express it in initial-period purchasing power. This does not mean that every price increased 8%. Different households buy different combinations of goods and can experience different changes in living costs.

For a fixed nominal loan, the lender knows the contracted dollars but not their future purchasing power. Expected inflation helps shape the rate negotiated at the start. Realized inflation determines the purchasing-power result afterward. Unexpected inflation can redistribute purchasing power between parties to existing contracts, but their complete financial positions also include wages, assets, expenses, and other debts.

Falling inflation means prices are rising more slowly, if inflation remains positive. It does not mean the general price level has returned to its earlier value. A decline in the price level is deflation. When judging a policy or a news report, separate the price level, its rate of change, and the purchasing power of a particular income. These distinctions prevent a correct calculation from supporting the wrong conclusion.

Three distinct measurements

Question	Calculation	Meaning
How many dollars?	$42,400	Nominal pay
What happened to prices?	104 / 100 - 1 = 4%	Inflation
How much purchasing power?	$42,400 / 1.04	$40,769.23 in old dollars

Hypothetical example. A broad price index may differ from one household's spending pattern.

Sources: S11, S12.

T

LESSON 06 • MEETING 7 • TRY / 15 MINUTES

The club's growing account

Pairs; calculator permitted; agree on units before calculating.

A fictional school club starts with $2,000 in a guaranteed account earning 5% for one year, with no fees or taxes. Its event-supply bundle initially costs $100. Analyze year-end prices of $102, $105 and $108. The bundle is the club’s price measure. Separately, the club lends $1,000 for a promised $1,060 repayment at year-end. At signing, it expects the relevant price index to rise from 100 to 102. It actually reaches 108. The borrower pays in full. Use exact growth-factor comparisons and round percentages to two decimal places.

L06.A1 Find the account’s ending balance. At each supply price, calculate bundle-equivalents of purchasing power, allowing fractions, and the exact real return. Compare with the initial 20 bundles.

L06.A2 For the separate loan, find the repayment expected and actually received in beginning-of-year dollars. Calculate forecast and realized real returns. How much purchasing power did the lender lose relative to its forecast?

L06.A3 Suppose supply-price inflation falls from 8% this year to 2% next year. Starting at $108, find next year's bundle price. Explain why lower inflation need not restore the old price.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 06 • MEETING 7 • REFLECT

Return to the question

Inflation and real returns

Worked example • A larger paycheck, a smaller gain

Hypothetical annual pay increases from $40,000 to $42,400. The relevant price index rises from 100 to 104. Ignore taxes.

Nominal pay growth: $2,400 / $40,000 = 6%.

Price growth: 104 / 100 - 1 = 4%.

New pay in old purchasing power: $42,400 / 1.04 = $40,769.23.

Real pay growth: 1.06 / 1.04 - 1 = 1.923%.

Pay buys about 1.92% more, rather than 6% more. The subtraction approximation gives 2%.

The account ends with more dollars in every scenario, but its usefulness changes with supply prices. When prices rise 2%, it buys more bundles; when prices rise 5%, it buys the same amount; when prices rise 8%, it buys less. The appropriate judgment depends on the purpose of the saving. A positive nominal return does not settle the question.

The separate loan pays the full promised $1,060. The lender expected $1,039.22 of beginning-year purchasing power but receives $981.48, a $57.73 shortfall before rounding. The forecast real return is +3.92% and the realized return is -1.85%. A contract can be honored in dollars while missing an expected purchasing-power result. Identify the promise, price measure and comparison date.

Discuss

• Should a club use a broad consumer price index or the prices of its actual supplies to judge whether its event budget has improved?

• How would an inflation-linked repayment change the risks taken by the two clubs?

• Which information would you need before claiming that an individual borrower benefited from unexpected inflation?

TAKEAWAY A financial result has a dollar value and a purchasing-power value. State the price measure and time period before deciding whether a gain has made someone better off.

CHECK Lower inflation does not necessarily mean lower prices. If inflation falls from 8% to 2%, prices generally continue rising, just more slowly. Also, a price increase in one product is not sufficient evidence of an increase in the general price level.

R LESSON 07 • MEETING 8 • UNIT 2 • READ / BEFORE THIS LESSON

Overnight money and the Fed

How can the price of money for one night affect a loan that lasts years?

Two people can pay one another without using paper cash. If they bank at the same institution, the bank can change the balances in its own records. If they use different banks, the payment usually requires settlement between institutions. Banks hold balances at the Federal Reserve called reserves. Those balances are different from the deposits that households hold at commercial banks. Moving a customer payment across banks can therefore move reserves as well as change customer deposit balances.

Consider a hypothetical bank that begins the day with $60 million in reserves. Its customers send $25 million to other banks, while incoming payments bring it $10 million. It ends with $45 million. If it wants $50 million available, it needs another $5 million. The bank may borrow funds overnight, sell an asset, or use another permitted funding arrangement. Another institution might be willing to lend. The decision is about timing and available payment resources, not necessarily whether the bank owns more than it owes.

In the federal funds market, eligible institutions borrow reserve balances overnight without collateral. The Federal Open Market Committee (FOMC) sets a target range. The New York Fed summarizes actual trades with a volume-weighted median. At least half the reported dollar volume is at or below the rate, and at least half is at or above it. The Fed’s Board of Governors sets today’s single interest rate on reserve balances (IORB). In 2019 there were separate rates for required and excess reserves.

Customer payments between commercial banks move reserves from one bank to another. Tax payments move funds into the Treasury’s account at the Fed. Paying banks lose reserves, while another commercial bank does not receive them. Treasury-debt settlement also moved funds to Treasury in September 2019. On September 17, the effective federal funds rate reached 2.30%, above the 2.25% target ceiling. The New York Fed supplied reserves against securities through overnight repo.

Why does interest on reserves matter? A bank compares what it could earn on reserves with the interest offered by another borrower. A higher safe return makes a low-rate loan less attractive, other things equal. Institutions differ in their access to reserve interest, their costs, and the risks they can take. Private loan rates also reflect future expectations, competition, and possible default. If the Fed raises the rate it pays on eligible reserve balances, why might two banks still charge different rates for loans to businesses?

E

LESSON 07 • MEETING 8 • EXPLAIN

How it works

Overnight money and the Fed

A customer deposit is a liability of a commercial bank. A reserve balance is an asset that an eligible institution holds at the central bank. When a customer transfers $10 to another bank, the sending bank can lose $10 of reserves and $10 of deposit liabilities; the receiving bank gains both. That settlement moves reserves across the system. It does not, by itself, change their total. A bank may need funding even when the banking system as a whole has ample reserves.

In the ample-reserves framework described by the Federal Reserve, administered rates are central to keeping short-term market rates near the policy target. IORB supplies an alternative return for eligible institutions. Other facilities help transmit policy to institutions with different access or provide funding against eligible collateral. Our two-bank activity isolates the alternative-return idea; it does not reproduce the full mix of actual federal funds market participants.

A policy rate can influence a longer-term loan without fixing it. A lender considers expected short-term rates over the loan's life, inflation, possible default, funding costs, and compensation for committing funds. A policy announcement can change expectations immediately even though the effect on spending arrives later. This is one reason a longer-term rate may move before an announced policy change, or may move differently from the current overnight rate.

Interest rates also create tradeoffs. Higher borrowing costs can restrain some spending, but they can make useful projects harder to finance. Lower rates may support activity while increasing other pressures. Distinguish the mechanical question of implementing a rate target from the judgment about which target best serves economic objectives. A clear mechanism does not eliminate disagreement about the decision.

Follow the claims

Balance or rate	Who holds or sets it?	Role
Customer deposit	Customer holds claim on bank	Payment balance
Reserve balance	Bank holds claim on Fed	Settlement asset
Federal funds target	FOMC sets target range	Policy choice
IORB	Fed sets rate for eligible balances	Alternative return

Conceptual map, not a complete list of payment systems or monetary-policy instruments.

Sources: S13, S14, S15, S16.

T

LESSON 07 • MEETING 8 • TRY / 15 MINUTES

Close the banks' books

Pairs; one student represents each bank; calculators permitted.

In a hypothetical payment system, Bank A starts with $120 million in reserves and Bank B with $80 million. A's customers send $50 million to B; B's customers send $10 million to A. Each bank wants at least $100 million after settlement. B may lend its excess reserves to A for one night at 4.5% annual interest. Alternatively, B earns 4.0% annual interest on reserves. Use a 360-day year. Ignore credit risk, fees, regulations, taxes, and any reserve-interest accounting during the payment step. These rates are invented for instruction, not current policy rates. For the final comparison only, raise the reserve rate to 5.0% while leaving the proposed loan rate unchanged.

L07.A1 Calculate each bank's reserves after customer payments. What loan amount would put both banks at $100 million? Did the payments change total reserves?

L07.A2 Find B's one-night loan interest and the reserve interest it forgoes on the lent amount. Calculate its additional interest in dollars from lending.

L07.A3 After the reserve rate rises to 5.0%, repeat the one-night interest comparison. What loan rate makes B indifferent under the stated exclusions? Explain why this does not mean the Fed directly sets every loan rate.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 07 • MEETING 8 • REFLECT

Return to the question

Overnight money and the Fed

Worked example • A one-night comparison

Hypothetical bank has $6 million available overnight. Compare lending at 3.6% annually with holding reserves at 3.0%. Use a 360-day year and ignore costs and risk.

Loan interest: $6,000,000 × 0.036 / 360 = $600.

Reserve interest: $6,000,000 × 0.030 / 360 = $500.

Additional interest from lending: $600 - $500 = $100.

The extra $100 is compensation to compare with any additional risk, costs, or constraints. It is not automatically a good deal.

Customer payments leave A with $80 million and B with $120 million. Lending $20 million from B to A redistributes reserves so that each has $100 million. No new reserve balances were created by the customer payments or by this interbank loan. A's liquidity need and B's investment decision are linked through a market transaction.

The alternative return changes the bargaining position. When holding reserves pays 4%, a 4.5% loan offers extra interest under our stripped-down assumptions. When holding reserves pays 5%, that same loan becomes less attractive. This comparison helps explain how an administered rate can influence market rates. Applying the idea to an actual economy requires allowing for varied access, credit risk, collateral, and expectations. Choosing a rate target also requires judgment about competing economic effects.

Discuss

• Can an individual bank face a reserve shortage while the banking system has plenty of reserves?

• Why might an institution accept a rate that looks unattractive when we ignore differences in access, costs, or constraints?

• What information would a policymaker need before deciding whether to raise rates when inflation and employment give conflicting signals?

TAKEAWAY An overnight rate matters because it changes the alternatives available to financial institutions. Those alternatives influence other prices and decisions, although the transmission is neither immediate nor identical across borrowers.

CHECK The Fed does not set one interest rate that every lender must charge. It sets a policy target and particular administered rates. Longer-term and private borrowing rates also reflect expectations, default risk, funding conditions, and other features of the contract.

UNIT 3 • LESSONS 08-11 • MEETINGS 9-12

Risk and decisions under uncertainty

A repair shop can lose a machine. A photography business can face a disappointing resale price. We will use familiar decisions to explore insurance, diversification, borrowing, and options, asking what each choice protects and what risks remain.



What would the photography club pay for the right to sell its camera at a set price?

The lessons ahead

08. Insurance and expected value
09. Diversification under stress
10. Leverage and forced selling
11. Options and asymmetric payoffs

Questions to carry into class

- What might you pay to avoid a loss you could not comfortably absorb?
- What happens if several investments are exposed to the same problem?
- How can borrowing change both the gains and the losses from an investment?

> **KEEP THE CONNECTION**
>
> The size of a possible loss matters, but so do its timing and the resources available to meet it. Keep all three in view.

R LESSON 08 • MEETING 9 • UNIT 3 • READ / BEFORE THIS LESSON

Insurance and expected value

Why pay more for insurance than the average loss it covers?

In 1752, Benjamin Franklin and fellow firefighters founded the Philadelphia Contributionship so property owners could share fire losses. A homeowner who applied for coverage could expect a visit. The company sent a surveyor to inspect the building before its directors set the rate. Pooling losses was part of the bargain. So was understanding what kind of building the other owners were being asked to insure.

Consider a fictional repair shop today. It owns a $10,000 machine. Suppose the chance of an accident that destroys it this year is 1%, and otherwise there is no damage. Its expected loss is 0.01 × $10,000, or $100. That is a probability-weighted average. At the end of the year this shop will have lost either $10,000 or nothing.

An insurer offers to cover the entire loss for a $140 payment called a premium. The shop pays the premium in either outcome. If the insurer honors its promise, the shop pays $40 more than its expected uninsured loss to avoid a $10,000 surprise. An owner might prefer a certain cost to a gamble with the same average cost. That preference is called risk aversion. The decision also depends on how much cash the shop has and how long it could stay open without a working machine.

The insurer can cover many shops. When one shop’s loss tells us little about other shops’ losses in the same policy year, the fraction with losses can become more predictable in a larger pool. A wildfire that reaches several shops presents a shared risk. Premiums must cover expenses, and the insurer needs resources for claims above expectations.

Real policies specify which losses qualify and how much the customer retains. A deductible is the part of a covered loss the customer must bear before the insurer pays under the policy. Our $140 policy has no deductible. If you were the repair-shop owner, what would you want to know about the insurer before relying on its promise?

No written response required. Bring your initial judgment to the discussion.

E LESSON 08 • MEETING 9 • EXPLAIN

How it works

Insurance and expected value

To calculate an expected loss, list all possible losses, multiply each by its probability, and add the products. The outcomes must be mutually exclusive and together cover all possibilities. Their probabilities sum to one. Keep three payments separate: the loss suffered by the customer, the claim the insurer owes, and the premium the customer pays.

Insurance can create value by shifting financial exposure toward a party better able to bear it. For a customer with limited resources, replacing an occasional devastating payment with a predictable premium may be worth more than the extra expected dollar cost. We do not need a numerical utility function to recognize that equal expected dollars can have unequal consequences. A preference for protection can be rational without being shared by every customer.

Pooling works best when many losses are not strongly linked. An insurer with a large pool still needs capital, liquidity, and appropriate contract terms. Expected claims are a planning quantity rather than a maximum. Costs include administration and the resources needed to support uncertain future payments. Comparing premium income only with expected claims does not establish that the remaining amount is pure profit.

Contracts also affect incentives. A customer who bears none of a loss might take less care, while an insurer might struggle to observe the customer's risk. Deductibles, inspections, and coverage conditions can address parts of those problems, but they also leave customers with more exposure or create administrative costs. Evaluate a design by asking which losses it transfers, which behavior it encourages, and whether the promised payer can perform under stress.

Follow the hypothetical policy

Outcome	Customer pays	Insurer pays claim
No loss	Premium: $250	$0
Covered $5,000 loss	Premium + deductible: $750	$4,500
Probability-weighted average	$270	$180

Assume a 4% chance of the $5,000 loss and a 96% chance of no loss. The annual premium is $250 and the deductible is $500. The insurer column shows claims paid.

Sources: S17, S18.

T LESSON 08 • MEETING 9 • TRY / 15 MINUTES

Insure the workshop network

Groups of three or four; assign customer, insurer, and skeptic roles.

A hypothetical insurer covers 100 workshops. Each has a 2% annual chance of one $40,000 loss and otherwise no loss. Each pays a $1,000 premium for full contractual coverage, with no deductible or exclusions. Expenses total $10,000. For A1 assume every claim is paid in full. In A2 calculate claims owed under the contracts. In A3 test whether the insurer can honor them when five workshops suffer losses. Premiums are collected and expenses paid before claims. There is no additional capital, investment income or tax. Independence is unnecessary when adding expected claims owed.

L08.A1 Assuming full payment of every claim, find one workshop’s expected uninsured loss and the additional expected cost of insurance. Explain why an owner might buy it.

L08.A2 Find total premiums, expected contractual claims owed, and the balance after expected claims and expenses. Is this balance guaranteed profit?

L08.A3 For five actual losses, calculate claims owed and the funding shortfall. Propose credible backing, state the funds and stress it covers, and identify a cost or limitation.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 08 • MEETING 9 • REFLECT

Return to the question

Insurance and expected value

Worked example • Insurance with a deductible

Hypothetical annual chance of a $5,000 covered loss is 4%. A policy costs $250 and has a $500 deductible. Otherwise there is no loss.

Expected uninsured loss: 0.04 × $5,000 = $200.

Insurer payout after a loss: $5,000 - $500 = $4,500.

Expected insurer payout: 0.04 × $4,500 = $180.

Expected customer cost with insurance: $250 + 0.04 × $500 = $270.

Expected cost rises $70, but the customer's cost in the loss scenario falls from $5,000 to $750, including the premium.

If the insurer pays its claims, the workshop customer exchanges a possible $40,000 bill for a known $1,000 premium. The expected loss is only $800, but the extra $200 can be an acceptable price for avoiding severe disruption. This is a comparison of consequences, not a claim that the expected-value calculation is wrong. Another owner might reasonably retain the risk.

Expected contractual claims owed leave a $10,000 balance after expenses. Five actual losses instead create a $110,000 shortfall. The stated marginal probabilities do not identify how likely five losses are or how much an insolvent insurer would actually pay. Additional liquid capital or credible reinsurance can support the promises, at a cost. Ask what funds will be available for the specified stress.

Discuss

• Would an owner with a large cash reserve value this coverage in the same way as an owner living close to insolvency?

• How might a deductible change both the customer's behavior and the value of protection?

• If the insurer raises premiums after a damaging year, what evidence would distinguish higher expected costs from a change in profit margins?

TAKEAWAY Expected value helps price a risk, but it does not describe every consequence of bearing it. Insurance can benefit both parties when protection matters and the insurer can support its promises.

CHECK Buying insurance with a premium above the expected claim is not automatically irrational. Customers may value avoiding a disruptive loss. Conversely, an insurer's positive expected margin does not guarantee profit or prove that it has enough cash and capital for a bad year.

R LESSON 09 • MEETING 10 • UNIT 3 • READ / BEFORE THIS LESSON

Diversification under stress

Does owning more investments always mean taking less risk?

In a fictional town, an investor owns the outdoor swimming club and worries about a rainy summer. The owner of the indoor climbing center has the opposite worry: sunshine keeps customers outdoors. The investor buys a share of the climbing center. The weather forecast may matter less to her now. Has she made the two businesses safe, or has she protected herself against one particular problem? Combining investments that respond differently to events is one way to diversify.

A portfolio is a collection of investments. If half its initial value is in one investment and half in another, its one-period percentage return is the average of their returns, assuming no additional deposits, withdrawals, or rebalancing during the period. If one investment gains 12% while the other loses 4%, that equal-weight portfolio gains 4%. Combining them changes the possible outcomes without making the weaker investment disappear.

Correlation describes how two quantities vary together. We can explore that idea by looking at a few scenarios. On sunny days, gains at the swimming club may offset losses at the climbing center. In the rain, the roles reverse. Yet both businesses still need roads, electricity, and customers who can afford a visit. Which of those dependencies would show up in a comparison of sunny and rainy days alone?

Now the only access road closes for the season. Visitors can reach neither business. The owner who bought both still has the benefit of diversification across the two weather outcomes. She has little protection against losing the road. Imagine adding ten other businesses in the same town. Would adding their names to the account change how customers get there?

A stress test asks how a position would perform under a specified adverse scenario. It can expose vulnerabilities that an average return or a short history misses. It cannot prove that every possible bad outcome has been considered, and assigning probabilities to unfamiliar scenarios is difficult. Before class, think about two investments that look different on the surface. What single event could hurt both of them at the same time?

No written response required. Bring your initial judgment to the discussion.

E LESSON 09 • MEETING 10 • EXPLAIN

How it works

Diversification under stress

For a one-period portfolio with no borrowing or changes in holdings, multiply each asset's return by its initial portfolio weight and add. The weights sum to one. The expected portfolio return is the same weighted average of the assets' expected returns. Diversification does not create extra expected return merely by mixing positions. Its potential benefit lies in the range and combination of outcomes.

A common shock can reduce that benefit. Two investments might respond differently to local weather but both depend on the same road. In actual markets, shared demand, financing conditions, or forced selling can create links among apparently distinct assets. Correlations are descriptive measurements over specified data. They are not permanent contracts promising how the next crisis will unfold, and they do not necessarily become one in every downturn.

Scenario analysis complements an average. Ask what drives each asset's cash flows, whether it can be sold when needed, and what else might change in the adverse scenario. An outcome that is unlikely can still dominate the decision if its consequences are severe. A probability-weighted average and a worst-case calculation answer different questions; neither should be presented as a complete description of risk.

Holding a cash reserve can reduce exposure to the modeled business losses, but it also changes returns in favorable states and may introduce purchasing-power risk over time. Diversification and liquidity are therefore design choices with costs and limits. A useful portfolio explanation identifies the sources of risk, not just the number of holdings, and states which losses the proposed design is intended to withstand.

Different weather, shared access

Scenario	Swimming club A	Climbing center B
Sunny season; probability 40%	+20% return	-10% return
Rainy season; probability 40%	-10% return	+20% return
Road closure; probability 20%	-30% return	-30% return

Invented, mutually exclusive one-year scenarios for the activity. Probabilities are assumptions, not empirical estimates.

Sources: S19, S20, S21.

T LESSON 09 • MEETING 10 • TRY / 15 MINUTES

Two businesses, one road

Pairs; calculate first, then compare design choices with another pair.

Use the scenario returns on the preceding EXPLAIN page. Invest $10,000 for one year in the two fictional businesses shown in the scenario table. Plan A puts all $10,000 in the swimming club. Plan B puts $5,000 in each business. Plan C keeps $3,000 as cash earning 0% and puts $3,500 in each business. Use the table's mutually exclusive probabilities: sunny 40%, rainy 40%, and road closure 20%. No borrowing, fees, taxes, distributions, or rebalancing occur, and the returns include all changes in investment value. Cash retains its nominal value. At year-end the investor can sell each business holding for its stated value and receive cash immediately. Treat the road closure as the specified stress, not the worst event imaginable. An investor needs at least $8,000 available at year-end.

Use the scenario returns in EXPLAIN. Record dollar ending values, then show the expected-return calculation on the lines.

Plan	Sunny 40%	Rainy 40%	Road closes 20%	Expected ending value
A				
B				
C				

L09.A1 Calculate Plan A and Plan B ending values in each scenario. What variability does Plan B remove, and what loss remains?

L09.A2 Find probability-weighted ending values and expected returns for Plans A and B. Compare them. Does the plan with the smaller sunny-to-rainy spread also reduce the road-closure loss? Use a value from each plan.

L09.A3 Calculate Plan C's ending value in each scenario. Which plans meet the $8,000 need in every listed scenario? How much cash would an otherwise equal-weight business portfolio need to meet it under the road closure?

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 09 • MEETING 10 • REFLECT

Return to the question

Diversification under stress

Worked example • Equal weights, different outcomes

Hypothetical $4,000 portfolio puts $2,000 in each of two businesses. In a scenario, A gains 12% and B loses 4%. No fees or borrowing.

A ends at $2,000 × 1.12 = $2,240.

B ends at $2,000 × 0.96 = $1,920.

Portfolio ends at $4,160, a $160 gain.

Return: $160 / $4,000 = 4%, also 0.5(12%) + 0.5(-4%).

The portfolio return is between the two asset returns. This one scenario does not establish its full risk.

The equal-weight business portfolio earns 5% in either ordinary-weather state, so it removes the variation between those two outcomes. It still loses 30% in the road-closure state. Both concentrated and equal-weight plans have the same expected return in this constructed example, but their distributions differ. Calling one average the whole risk picture would miss information important to the investor.

The 30% cash allocation limits the modeled loss, yet leaves only $7,900 after a road closure, just below the required $8,000. At least one-third of the original funds must remain in cash to satisfy that particular condition. This does not certify the portfolio against every future event. A decision can be well supported by a stated stress test while remaining exposed to unmodeled events, uncertain probabilities, and changes in purchasing power.

Discuss

• Would adding more businesses located on the same road address the vulnerability identified here?

• If the probability of road closure were unknown, which conclusions would remain valid and which would need revision?

• How could financing arrangements create a common exposure even for businesses in different industries?

TAKEAWAY Diversification depends on the sources of exposure and how outcomes move together. Count shared vulnerabilities as well as holdings, and test whether the design can meet a concrete need under stress.

CHECK Diversification does not guarantee a positive return, and a crisis does not automatically eliminate every diversification benefit. Identify the particular risk being reduced, the shared shock that remains, and the assumptions behind the scenario or historical correlation estimate.

R LESSON 10 • MEETING 11 • UNIT 3 • READ / BEFORE THIS LESSON

Leverage and forced selling

Can you forecast the final price correctly and still lose money?

A fictional investor has $10,000 and borrows another $40,000 to buy $50,000 of securities. The securities are assets, the loan is debt, and the difference is the investor's equity in the position. Borrowing allows the investor to hold more assets than their own funds could buy. This is financial leverage. For this course, one useful leverage ratio is total assets divided by equity: $50,000 divided by $10,000 equals five.

Suppose the securities rise 10% to $55,000. Ignoring interest and other costs, the debt remains $40,000, leaving $15,000 of equity. The investor has earned $5,000 on the original $10,000, a 50% gain. If the securities instead fall 10% to $45,000, equity falls to $5,000, a 50% loss. The same borrowing that magnifies gains also magnifies losses. The asset return and the return on the investor's own money are different percentages.

A lender wants some protection if the assets behind a loan lose value. Property pledged for repayment is collateral. A contract can require the investor to keep a minimum amount of equity in the position. If asset prices fall, the investor may have to put up cash or sell assets to repay part of the debt. The fictional contract we will calculate in class has its own terms.

In March 2021 this timing problem became urgent for Archegos, an investment firm. It had contracts with banks that gave it exposure to stock prices without having to buy all the shares itself. When prices fell, Archegos had to cover losses or provide collateral. It ran out of funds. Credit Suisse had bought shares to offset its side of the contracts and had to sell them as prices fell. A long-run opinion about those stocks could not settle the bill that came due that week.

Borrowing is not inherently a mistake. It can finance useful assets and projects, but the terms determine which risks accompany the additional purchasing power. When evaluating a position, examine not only its possible final value but also its path and the demands that can arise along the way. Before class, consider this question: what resources or contract terms would allow an investor to survive a temporary price decline without selling?

No written response required. Bring your initial judgment to the discussion.

E LESSON 10 • MEETING 11 • EXPLAIN

How it works

Leverage and forced selling

Equity equals asset value minus debt. If debt is fixed over a short interval, each dollar change in the asset value changes equity by the same dollar amount. Because equity is smaller than total assets in a borrowed position, its percentage change is larger. With initial assets A and equity E, ignoring interest and other changes, the equity return equals the asset return multiplied by A/E. The relationship describes both gains and losses.

A lender can demand action while a position still has positive equity. Suppose a private loan contract requires equity equal to at least 20% of the securities' current value. After a price decline, the position may have positive equity and still fall below that threshold. The investor needs cash or must reduce the debt. We chose 20% for this exercise. Actual borrowing requirements depend on the asset, the agreement, and applicable rules.

Supplying outside funds and selling assets are not identical adjustments. If new money is used directly to repay debt, the securities stay in place, debt falls, and position equity rises. If securities are sold at their stated market value and all proceeds repay debt, assets and debt fall equally. Equity initially stays unchanged, but it becomes a larger fraction of the smaller asset position.

Forced sales can also impose losses on other holders if prices fall. That feedback is a mechanism, not a prediction that every sale creates a crisis. Longer funding terms, more initial equity, and available cash can reduce vulnerability but have costs. A stress test should therefore ask both how much equity might be lost and what resources must be available before the anticipated final payoff arrives.

Trace the worked example

State	Assets / debt	Equity / equity return
Purchase	$80,000 / $60,000	$20,000 / starting point
After 10% asset gain	$88,000 / $60,000	$28,000 / +40%
After 10% asset loss	$72,000 / $60,000	$12,000 / -40%

Hypothetical worked example. Debt is fixed and interest is omitted. The activity uses different amounts and adds a maintenance condition.

Sources: S22, S23, S24.

T LESSON 10 • MEETING 11 • TRY / 15 MINUTES

Meet the funding demand

Pairs; calculator permitted; draw a balance sheet for each adjustment.

An investor buys $100,000 of identical securities with $25,000 of personal funds and a $75,000 loan. Ignore interest, fees, taxes, and price effects of the investor's own sales. The securities fall in value to $90,000. The fictional loan contract requires equity to be at least 20% of the securities' current value. The lender requires immediate compliance. Analyze two separate remedies: new outside cash used directly to repay debt, or selling securities at current market value and using all proceeds to repay debt. For the final question, assume the investor uses the minimum required sale and that the securities' unit price then returns to its original purchase level. No further funding changes occur.

Record dollars. The two remedies are alternatives. The final row follows only the minimum-sale remedy.

Position / remedy	Asset value	Debt	Equity
After price decline			
Outside cash repays debt			
Minimum sale repays debt			
After sale, then price recovery			

L10.A1 Find the position’s equity after the decline, its percentage loss, and its equity-to-assets ratio. Is there enough asset value to cover the debt? Does the position meet the contract?

L10.A2 Calculate the minimum outside cash repayment and, separately, the minimum securities sale needed for compliance. Show assets, debt, and equity after each remedy.

L10.A3 After the minimum sale and a recovery to the original unit price, find ending equity. Compare it with keeping the original position. What did the contract require at the low price? Identify a condition that would have allowed the investor to keep all the securities.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 10 • MEETING 11 • REFLECT

Return to the question

Leverage and forced selling

Worked example • Same asset move, larger equity move

Hypothetical securities cost $80,000, funded with $20,000 equity and $60,000 debt. Ignore interest and fees.

Initial assets/equity: $80,000 / $20,000 = 4.

After a 10% asset gain: $88,000 - $60,000 = $28,000 equity.

Equity gain: $8,000 / $20,000 = 40%.

After a 10% asset loss: $72,000 - $60,000 = $12,000 equity, a 40% loss.

Four times assets-to-equity magnifies a 10% asset change into a 40% equity change in this simplified interval.

The position still has $15,000 of equity after the price decline: its assets are worth $90,000 and its debt is $75,000. Nevertheless, the 16.67% equity ratio violates the specified maintenance condition. Meeting the demand requires $3,000 in outside repayment or a $15,000 sale with debt repayment. The two remedies produce different future exposures even though both restore a 20% ratio.

After the sale, unit-price recovery leaves about $23,333 of equity. A waiver with unchanged debt would have restored $25,000. Paying $3,000 from outside instead retains all securities and leaves $28,000 equity after recovery, including the new contribution. The contract required immediate compliance. A forecast of recovery needs a plan to fund the wait, and comparisons must count additional owner contributions.

Discuss

• What information about funding terms is missing from a forecast that an asset will be worth more in two years?

• Who benefits from a stricter collateral rule, and what problem might arise if many lenders tighten rules together?

• How would adding loan interest change the conclusion that a complete asset-price recovery restores the original equity?

TAKEAWAY Borrowing magnifies gains and losses and can create demands before an investment reaches its expected payoff. Evaluate the path, funding terms, and ability to meet those demands alongside the forecast.

CHECK Positive equity does not guarantee that a financed position can remain open. A maintenance condition can require action before insolvency. Selling assets and repaying debt may restore a ratio without restoring lost equity, and a later price recovery may not reverse the damage.

R LESSON 11 • MEETING 12 • UNIT 3 • READ / BEFORE THIS LESSON

Options and asymmetric payoffs

Can you limit a loss and still gain if the price rises?

Imagine that a school photography business owns a camera it plans to sell at the end of the season. The resale price might fall, but the business needs enough money from the sale to buy its next camera. A dealer offers a contract: pay a fee today and receive the right to sell the camera to the dealer for a specified price later. The owner can use that right if the market price falls, or sell elsewhere if the market price rises. This is a hypothetical example of an option.

A put option gives its buyer the right to sell a specified asset at a specified price under the contract’s terms. That price is the strike price. A call option gives its buyer the right to buy instead. The buyer pays a premium for the right. The seller receives that premium and accepts the corresponding obligation. The two sides do not have the same choices: the buyer may decide whether using the right is worthwhile, while the seller must perform when validly required.

Suppose a simplified put lets the camera owner sell for $600 at the end of the season. If the camera’s market value then falls to $450, the right adds $150 to what the owner could otherwise receive. If its market value is $750, the owner can sell in the market and let the put expire unused. However, the premium paid earlier is a cost in both situations. A contract that pays nothing at expiration can still have served its intended protective purpose.

A share is a small ownership claim in a company. In class we will use simplified one-share contracts, exercised only at expiration, so we can focus on the arithmetic. Actual listed stock options commonly cover 100 shares, and their exercise rules vary. The payoff is the value produced by the option at expiration. Profit subtracts the premium and any other costs. Confusing these two quantities can make an unprofitable purchase look successful.

An option does not have to be used for protection. Someone with no offsetting exposure can buy one to speculate on a price change. A future purchase obligation can also create a risk worth hedging. The same contract may therefore serve different purposes in different portfolios. Before deciding whether a contract reduces risk, ask what else its owner holds. What would make paying for a put sensible even if the put eventually expires without a payoff?

No written response required. Bring your initial judgment to the discussion.

E LESSON 11 • MEETING 12 • EXPLAIN

How it works

Options and asymmetric payoffs

Let S be the asset's price at expiration and K the strike price. A buyer with a call can buy at K when S is higher. The call pays max(S − K, 0). A buyer with a put can sell at K when S is lower. The put pays max(K − S, 0). Here max means choose the larger of the two numbers. Subtract the premium from either payoff to find the buyer's profit on the option alone. Assume no fees, taxes, or interest.

A protective put combines an asset with a put on that same asset. At expiration, the combined value is at least the strike price if the contract performs as promised. Above the strike, the asset's rising price still benefits the owner. This creates a floor on the terminal value, but the owner paid to obtain that floor. The floor on total profit must account for both the original asset purchase and the option premium.

A purchased option can expire worthless, so a buyer can lose the entire premium even though the dollar loss on that option is limited. The seller takes the other side of its payoff. Selling an uncovered call, for example, creates exposure that grows as the asset's price rises. A small premium does not mean a small possible obligation for the seller.

An expiration diagram answers a particular question: what happens at the final date? It does not predict the option's market price tomorrow. Before expiration, remaining time, expected price variability, and other conditions also matter. Our purpose is to trace contractual consequences, not to produce a trading strategy or an option-pricing model.

Hypothetical put: strike $24, premium $2

Price at expiration	Put payoff	Put profit
$14	$10	$8
$24	$0	-$2
$34	$0	-$2

One-share contract at expiration. Subtract the $2 premium from the payoff to find the buyer's profit.

Sources: S25, S26. Option profit graphs, p. 100.



T LESSON 11 • MEETING 12 • TRY / 15 MINUTES

Protect a share, or make a bet?

Pairs. Calculate independently, then compare each row before discussing the choice.

This is a hypothetical one-period market. A student investment club buys one share for $20 and one put on that share for a $1 premium. The put's strike is $18. Consider three possible share prices at expiration: $10, $18, and $26. The put can be used only at expiration and the counterparty always performs. For comparison, a second club owns no share and buys one call with a $22 strike and a $2 premium. This club has no other exposure to the share and no plan or obligation to buy it. Both contracts cover exactly one share. Ignore fees, taxes, dividends, and interest on invested cash. No probability is assigned to any outcome; do not calculate an expected return.

All entries are dollars at expiration. Include the original share cost and option premium when calculating profit.

Final share price	Put payoff	Share + put value	Share + put profit	Share-only profit	Call profit
$10					
$18					
$26					

L11.A1 For each final share price, find the put payoff and the final value of the share-plus-put position.

L11.A2 Find the share-plus-put profit in each outcome, then compare it with buying only the $20 share. What protection was purchased, and what was its cost?

L11.A3 Find the second club's call profit at each final price and its break-even price. For each club, identify the price risk it faced before buying the option and explain what the contract changes.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 11 • MEETING 12 • REFLECT

Return to the question

Options and asymmetric payoffs

Worked example • A purchased call

Hypothetical one-share call: strike $30, premium $3. Exercise only at expiration; ignore fees and interest.

If S = $25, buying at $30 is unnecessary: payoff $0 and profit -$3.

If S = $32, exercise produces $2 of payoff. Paying $3 for the call leaves a $1 loss.

If S = $40, payoff is $40 - $30 = $10; profit is $10 - $3 = $7.

Break-even requires S - $30 = $3, so S = $33.

An option can have a positive payoff and still lose money after its premium.

The first club paid $21 in total for a share and a protective put. Its terminal position cannot be worth less than $18 under the stated assumptions. That means its worst profit is -$3, not zero. The second club paid $2 for a chance to benefit from a rising share price, but had no offsetting exposure or future purchase to protect. At a final price of $26, both clubs gain, yet the reasons they entered their contracts differ.

Protection changes the distribution of outcomes and usually has a cost. Whether that cost is worthwhile depends on the buyer’s needs, available alternatives, and willingness to bear losses. We cannot rank the choices by expected return without probabilities. We also cannot infer the purpose of a derivative from its name alone. Understanding the whole position is necessary before saying that an option increases or reduces risk.

Discuss

• Does an unused protective contract prove the purchase was a mistake? What information would you need to judge that decision?

• How would your conclusion change if the protection provider could fail at the same time the share price falls?

• Why does a floor on final value differ from a guarantee that an investment earns a profit?

TAKEAWAY An option creates an asymmetric contractual payoff. Evaluate the premium, the underlying asset, and the rest of the owner’s position before deciding whether it provides useful protection or adds risk.

CHECK “The option paid something, so it made money.” A payoff is not a profit. A buyer must recover the premium and other costs before earning a positive profit, and a protected asset can still lose some of its initial value.

UNIT 4 • LESSONS 12-14 • MEETINGS 13-15

Financing businesses and projects

A student's garden sensor, a solar installation, and the purchase of an existing company all need money before their plans are complete. We will compare financing choices by following the cash, the ownership, and the obligations each choice creates.



Who pays for the panels before the project earns its first dollar from selling electricity?

The lessons ahead

12. Funding a new business
13. Financing a project
14. Buying a company with debt

Questions to carry into class

- What does a founder give up when new investors become owners?
- Which future payments would give a lender confidence in a project?
- Who benefits, and who bears more risk, when a company is bought with debt?

> **KEEP THE CONNECTION**
>
> A financing plan must work alongside the business itself. Look for the connection between operating cash and the payments promised to lenders and owners.

R LESSON 12 • MEETING 13 • UNIT 4 • READ / BEFORE THIS LESSON

Funding a new business

What does a founder give up when someone else supplies the money?

A student has built a working soil sensor. A gardener at the Saturday market wants ten, but the supplier needs to be paid before the student can assemble them. The first customer's interest gets the business closer to a sale. It doesn't put money in the account today. In this fictional case, the student has two offers to cover the supplier's bill. What would each offer cost if the sensors sold poorly? What if they became a hit?

Debt financing means borrowing under an agreement to repay. The lender receives a contractual claim rather than becoming an owner merely by making the loan. A $10,000 one-year loan at 10% simple interest requires $11,000 at the end of the year under those terms. The company's actual ability to pay depends on what happens to its business. A promise is not a guarantee, and lenders may ask for collateral, restrictions, or a personal guarantee. We must read the terms before deciding who bears a loss.

Equity financing means selling an ownership interest. A share represents part of that ownership. Suppose a founder owns 90 shares and the company issues 10 additional, identical shares to an investor. The founder still owns 90 shares, but now owns 90 out of 100, or 90%, of the company. The percentage falls because the total number of shares has increased. This reduction in percentage ownership is called dilution. It need not mean that the founder's dollar wealth falls: the company also receives the investor's money.

An angel investor generally invests personal money in an early business. A venture capital fund pools investors' money to make investments, commonly in businesses with substantial growth potential. Such investors may bring experience and contacts as well as cash. They may also request influence over decisions. A founder should therefore compare more than the dollar amount offered. Payment timing, control, downside protection, and the investor's expectations can all affect the relationship.

For our classroom comparison, every equity share will have the same rights and no investor will receive special priority. Real contracts can be more complicated. The important first step is to trace what each person contributes and what each person receives in different outcomes. If you expected your business to grow slowly and unpredictably, what would you want to know before choosing between a loan and a new equity investor?

No written response required. Bring your initial judgment to the discussion.

E LESSON 12 • MEETING 13 • EXPLAIN

How it works

Funding a new business

When a company sells newly issued shares, the payment goes to the company and can finance its operations. When one existing owner sells shares to another investor, the payment usually goes to that selling owner instead. The ownership changes hands, but the company does not automatically receive new money. This distinction separates raising capital from trading an existing claim.

A simple share issue can be described by its negotiated valuation. If an investor pays $20,000 for 20% of the company immediately after investing, the implied post-money equity value is $100,000. Subtracting the $20,000 new investment gives an implied pre-money equity value of $80,000. These are prices implied by the agreement under equal share rights, not an independent proof of what the company is worth. A persuasive forecast still depends on customers, costs, competition, and execution.

Debt and equity distribute outcomes differently. A lender is owed specified payments; common shareholders receive the residual after higher-priority claims have been met. In a simple limited-liability company with no guarantees, investors can lose their contributions without automatically owing every unpaid company debt personally. Actual liability and payment priority depend on the contracts and legal structure. Our activity specifies them so the arithmetic is unambiguous.

The financing choice can affect the business itself. A fixed payment may force a promising but cash-poor company to delay development or sell assets. An equity investor may tolerate delayed cash receipts but demand changes in strategy or governance. A founder’s best choice therefore depends on cash-flow timing and terms as well as possible financial returns. More retained ownership is not automatically more valuable ownership.

Who receives the money?

Transaction	Cash recipient	What changes?
Bank lends to company	Company	Company owes debt
Company issues new shares	Company	New ownership claims
Founder sells existing shares	Founder	Ownership changes hands
Investor sells to another investor	Selling investor	Ownership changes hands

Simplified transactions. A purchase of existing shares does not by itself finance new company operations.

Sources: S27, S28, S29.

T LESSON 12 • MEETING 13 • TRY / 15 MINUTES

Two offers for the sensor business

Pairs: one student represents the founder, the other a prospective financier. Switch roles for the final question.

A hypothetical company has 800 founder-owned shares and needs $50,000. Offer E provides $50,000 in exchange for 200 newly issued shares identical to the founder's shares. Offer D lends $50,000 for one year at 10% simple interest, all due at year-end. Compare the offers separately. After operations, the company liquidates: all assets are converted to cash. Available cash before paying financiers is either $30,000, $100,000, or $400,000 under either offer. These totals already include all business proceeds; do not add the initial funding again. There are no other claims, taxes, fees, or personal guarantees. Debt is paid first up to available cash; identical equity shares divide the remainder proportionally.

Use thousands of dollars in this table. Each founder/financier pair must add to the cash available.

Cash available	E · founder	E · investor	D · founder	D · lender	Unpaid debt
30					
100					
400					

L12.A1 Under Offer E, calculate total shares, investor ownership, founder ownership, and implied pre-money and post-money equity values.

L12.A2 For each of the three final cash totals, calculate what the founder and outside financier receive under each offer. Identify any unpaid debt.

L12.A3 Which offer would you prefer as founder? State a condition that supports your choice and one fact missing from the setup that could change it. Then explain the financier's risk.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 12 • MEETING 13 • REFLECT

Return to the question

Funding a new business

Worked example • New cash and new shares

A hypothetical founder owns 900 identical shares. The company issues 100 new shares at $100 each. There is no debt.

The company receives 100 × $100 = $10,000.

Total shares become 900 + 100 = 1,000.

The investor owns 100/1,000 = 10%; the founder owns 90%.

At the issue price, post-money equity value is $100,000 and pre-money equity value is $90,000.

The founder has the same 900 shares and a smaller percentage of a company that now has additional cash.

Offer E leaves the founder with 80% and the investor with 20%. Offer D lets the founder retain all the residual after a $55,000 debt claim, but low cash receipts can leave that debt unpaid. With only $30,000 available, the equity investor receives $6,000 and the founder $24,000 under E; the lender receives $30,000 and the founder nothing under D. The financing agreement changes who absorbs each outcome. The lender's $30,000 receipt means a $20,000 loss on the money lent, while $25,000 of its promised payment remains unpaid.

The founder receives more under the equity offer in the $30,000 and $100,000 outcomes. The debt offer leaves the founder more in the $400,000 outcome. Which trade would you accept before you knew the result? The answer depends on how likely you think each outcome is and what a loss would mean to you. In a continuing business, the repayment date and the investor's voting rights would matter too. In this model the company liquidates at year-end under either offer.

Discuss

• Could a founder's percentage fall while the value of the founder's ownership rises? Explain using new funding and business prospects.

• Why might a bank decline a loan even when the founder's average sales forecast looks attractive?

• What should a founder learn about a potential investor beyond the offered valuation?

TAKEAWAY Financing determines payment obligations, ownership, and decision rights. Compare the full distribution of outcomes and the timing of cash needs before concluding that retaining a larger ownership percentage is better.

CHECK "Selling 20% means giving away 20% of what I already had." A new share issue also brings resources into the business. Distinguish dilution of percentage ownership from a reduction in the dollar value of the founder's stake.

R LESSON 13 • MEETING 14 • UNIT 4 • READ / BEFORE THIS LESSON

Financing a project

Can contracts make an uncertain project easier to finance?

Imagine a company planning a small solar installation. Panels must be purchased and installed before the first electricity is sold. The founders want a loan, but the new company has no years of past sales to show the lender. Instead, they present a construction contract, an agreement to sell electricity, estimates of maintenance costs, and a plan for repaying the loan. This hypothetical example raises a practical question: how much confidence can contracts create about cash that has not arrived yet?

Project finance organizes funding around a particular project and its cash flows. A separate project company may own the equipment, sign contracts, and borrow. Under limited-recourse financing, lenders cannot automatically collect every unpaid amount from all the sponsor’s other businesses. Their rights are limited by the agreement, although guarantees or particular failures can create additional claims. Limiting recourse does not remove the risk. It changes who bears it and makes the project’s own ability to pay especially important.

Debt service means the interest and principal payments required during a period. Suppose a project receives $90,000 from customers and spends $55,000 on operation and maintenance. It has $35,000 before paying its lenders. If the year’s debt service is $25,000, there is $10,000 left for reserves or owners. If debt service is $40,000, the project faces a $5,000 shortage even though customers paid more than the operating bills. Revenue, operating cash, and cash available to owners are different quantities.

A contract may reduce one particular uncertainty. A long-term buyer can agree on an electricity price, but might still fail to pay. A fixed-price construction contract can assign some cost overruns to a builder, but cannot make an incapable builder capable. A floating-rate loan creates another uncertainty because its interest rate changes. An interest-rate swap can exchange payments calculated at a floating rate for payments calculated at a fixed rate. Matching those payments to the loan can stabilize its interest cost.

The details matter: the payment dates, rate definitions, and amounts must fit, and each counterparty must perform. In class we will trace a simplified swap one payment at a time before combining it with a loan. Which uncertainty would you investigate first before lending to a project: construction, customers, operating costs, or financing costs, and why?

No written response required. Bring your initial judgment to the discussion.

E

LESSON 13 • MEETING 14 • EXPLAIN

How it works

Financing a project

First trace the $200,000 loan in the table. The project owes its lender a benchmark rate r plus two percentage points. Its swap counterparty agrees to pay the project that same benchmark rate; in return the project pays a fixed 3%. Put yourself in the project's place. Two payments go out, one payment comes in. What remains after subtracting the receipt from the payments?

All three interest flows use the same starting balance for the same full year. The swap's notional amount is the reference amount used to calculate its payments. Here the parties exchange interest payments only. Combine them with loan interest and the project pays (r + 2%) + 3% − r = 5%. The activity uses a different loan and includes a principal payment.

Modigliani and Miller considered a project with the same operating cash flows under different financing plans. Suppose there are no taxes, transaction or distress costs, everyone has the same information, and investors can reproduce the financing on equal terms. Under those assumptions, rearranging debt and equity cannot raise their combined value. A change in how many kilowatt-hours the panels produce, by contrast, would change the project itself.

Contracts must also be evaluated together. A fixed sales price helps only if output is delivered and the buyer pays. A matched swap addresses the specified interest-rate exposure; it does not repair broken equipment or replace missing sales. Ask both which risk a contract assigns and whether the party accepting that risk can meet its obligation.

Three interest flows for a $200,000 loan

Project cash flow	At a 1% benchmark	At a 5% benchmark
Pay lender: r + 2%	$6,000 out	$14,000 out
Pay swap counterparty: 3% fixed	$6,000 out	$6,000 out
Receive swap payment: r	$2,000 in	$10,000 in
Net interest cost	$10,000	$10,000

Worked example for one year. At either benchmark rate the project pays a net 5%. This table includes interest only.

Sources: S30, S31, S32, S33.

T LESSON 13 • MEETING 14 • TRY / 15 MINUTES

The project’s first operating year

Groups of three: project owner, lender, and swap counterparty. Each person checks the payments they make or receive. Bring the electricity buyer back into the customer-loss discussion.

A hypothetical solar project costs $800,000, funded with $300,000 equity and a $500,000 loan. In its first operating year it collects $140,000 and pays $80,000 operating costs. Its loan charges annual interest at benchmark r plus one percentage point on the full $500,000; $20,000 principal is repaid at year-end after interest is calculated. Compare r = 2% and r = 6%. Under an optional swap, the project pays 4% fixed and receives r on $500,000 at year-end. Assume no fees, collateral calls, taxes, or counterparty failure. In a separate customer-loss stress, collections fall to $110,000 and costs remain $80,000. For A3 keep the swap in force and change only collections to $110,000. Choose either benchmark and explain why the choice does not affect the result.

Record dollars. Treat fixed swap payments as outflows and floating receipts as inflows. Include loan principal in financing payments.

First-year cash calculation	Benchmark 2%	Benchmark 6%
Loan interest		
Principal repaid		
Debt service without swap		
Cash remaining without swap		
Swap fixed payment		
Swap floating receipt		
Net financing payments with swap		
Cash remaining with swap		

L13.A1 At each benchmark rate, calculate loan interest, debt service, and cash remaining before owner distributions without the swap.

L13.A2 At each rate, enter loan interest, principal repayment, swap fixed payment, swap floating receipt, net financing payments, and cash left in separate rows. Name the recipient of each outgoing payment. Which payment changes the loan balance?

L13.A3 Under the customer-loss stress, find the cash surplus or shortage with the swap. Recommend one response or contract change, and identify a remaining risk or cost of your proposal.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 13 • MEETING 14 • REFLECT

Return to the question

Financing a project

Worked example • Matching three interest flows

A project borrows $200,000 at benchmark r plus two percentage points. Under a separate swap the project pays 3% fixed and receives r. Both interest legs use $200,000 for one full year. Assume no fees or principal repayment.

At r = 1%, the project pays $6,000 loan interest and $6,000 on the swap. It receives $2,000 on the swap. Net interest cost: $10,000.

At r = 5%, it pays $14,000 loan interest and $6,000 on the swap. It receives $10,000 on the swap. Net interest cost: $10,000.

Algebra: (r + 2%) + 3% - r = 5%; 5% of $200,000 is $10,000.

The specified benchmark exposure cancels if payments match and both parties perform.

Without the swap, the project has $25,000 left when the benchmark is 2% and $5,000 when it is 6%. With the swap, it has $15,000 left in either case. The owners give up part of the low-rate gain in exchange for a known financing cost.

If customer payments fall to $110,000, only $30,000 is available before financing. The project must find $15,000 to meet the $45,000 obligation. A reserve could pay the bill once. New equity or revised debt terms would require someone else's agreement. Which of these arrangements would you want in place before construction begins?

Discuss

• If the swap costs the project money when rates fall, has it failed to do its job?

• Which of the project's risks can the electricity buyer, builder, or lender control better than the owners? Which cannot be assigned cheaply?

• In the Modigliani-Miller thought experiment, what must change for rearranging debt and equity to change total value?

TAKEAWAY Project finance connects funding to specific cash flows and contracts. A well-matched hedge can remove a particular rate exposure while leaving operating, customer, and counterparty risks that still need attention.

CHECK "The swap fixes the loan, so the project is safe." The swap can stabilize the modeled interest cost when its terms match and it performs. It does not guarantee revenue, erase principal repayments, or eliminate possible operating losses.



R LESSON 14 • MEETING 15 • UNIT 4 • READ / BEFORE THIS LESSON

Buying a company with debt

Does a higher equity return mean the buyer improved the business?

In October 1988, RJR Nabisco's chief executive proposed buying the company with borrowed money. Its debt lost its A rating after the proposal. MetLife, which already held RJR debt, sued on November 17 while bids were still competing. The board accepted KKR's bid on December 1. A lawsuit records a dispute; it does not by itself establish wrongdoing or an eventual bond default. What could MetLife check in its bond contract before deciding whether to challenge the proposed borrowing?

An acquisition transfers ownership or control of a business or its assets. A leveraged buyout uses substantial borrowing to help finance that purchase. The borrowing may ultimately be owed by the acquired business. Debt allows the equity investors to supply a smaller portion of the purchase price, but the business must generate cash for the resulting obligations. Changing ownership does not automatically increase customer demand or make equipment more productive.

Consider a simplified business purchased for $100. If it later sells for $120, an all-equity buyer gains $20, or 20%, before any operating cash or costs. A buyer who initially uses $40 of equity and $60 of debt receives $60 after selling for $120 and repaying the $60 principal. Ignoring interest and other costs just for this illustration, that is a $20 gain on $40, or 50%. The business rose by the same $20 in both cases. The different percentage reflects the smaller equity investment and its larger exposure to losses.

Private equity funds pool investors' capital and may buy controlling interests in businesses. Their plans can include expansion, new management, better systems, or combinations with other companies. They can also include selling assets, changing staffing, or making distributions to owners. Each proposal needs evaluation: a cost reduction might remove waste, or it might reduce the capacity needed to serve customers later. A merger may create useful efficiencies, while also affecting competition or employees.

The purchase price, debt terms, operating plan, and eventual sale price all matter. A profitable exit for the owners does not by itself reveal how much came from better operations, financing, a favorable market, or costs borne by others. In class we will hold the operating business constant and change its financing first. What evidence would convince you that an acquisition improved the business rather than merely changing who received its cash?

No written response required. Bring your initial judgment to the discussion.

E LESSON 14 • MEETING 15 • EXPLAIN

How it works

Buying a company with debt

An acquisition begins with sources and uses of funds. The use is the purchase payment, plus any transaction expenses. Sources can include buyer equity and debt. In our simplified model the purchase price is $1,000,000 and expenses are zero. Financing it with $400,000 equity and $600,000 debt changes the claims on the acquired business; the cash paid to the seller is still $1,000,000.

Trace operating cash and sale proceeds separately. Operating cash is what remains after the specified operating expenses, before financing. Interest is paid from that cash. An exit price for the operating business is not automatically the amount received by shareholders: outstanding debt must also be repaid. If operating cash has already been distributed, do not add it into the quoted exit price again unless the valuation explicitly includes it.

Compare returns using the equity actually invested. A high percentage return can result partly from a smaller initial equity contribution. That same structure makes losses more concentrated on the equity and creates mandatory payments. A positive forecast does not establish that a business can survive every year along the route to an eventual sale. Cash might fall below interest before the owners can realize their predicted exit value.

Investors can earn a return because a business generates cash, because they negotiated a favorable purchase price, or because buyers later pay more for its future earnings. Paying down debt with operating cash leaves owners a larger share of the eventual sale proceeds. That repayment uses cash the business already earned; counting it as a second operating gain would double-count the same dollars. In a real buyout, changes in operations, taxes, or the risks borne by others also deserve attention.

Hypothetical acquisition: what should be investigated?

Proposed change	Possible benefit	Question to test
New equipment	Higher useful output	Does added cash exceed its cost?
Combine purchasing	Lower input costs	Are savings credible and lasting?
Add acquisition debt	Less buyer equity needed	Can cash support required payments?
Sell essential assets	Immediate cash	What future capacity is lost?
Change customer prices	Higher revenue per sale	What happens to demand and competition?

Each proposal needs evidence. A claimed benefit is not an established result.

Sources: S34, S35, S36.

T LESSON 14 • MEETING 15 • TRY / 15 MINUTES

Same factory, two financing plans

Pairs calculate A1-A3. Groups then review the maintenance proposal in A4 during the investment-committee debrief.

A hypothetical factory costs $1,000,000. Plan A uses $1,000,000 equity and no debt. Plan B uses $400,000 equity and $600,000 interest-only debt at 10% annually; all principal is repaid on sale. Both plans produce $120,000 operating cash after operating costs, before financing, at year-end. After paying interest, all remaining cash is distributed to equity. Immediately afterward, the operating business sells for $1,200,000; this sale price excludes the cash already distributed. Ignore taxes, fees, and operating changes. For a separate cash stress, replace operating cash with $40,000 and assume the sale is delayed. There are no reserves or automatic guarantees; further funding would require a new agreement.

Record dollars except in return rows. Start with the normal $1,200,000 sale; use the separate exit and cash stresses only in their labeled rows.

Measure	Plan A	Plan B
A1 · Normal-year interest		
Cash distributed to owners		
Net equity sale proceeds		
Total equity receipts		
Return on initial equity (%)		
A2 · Gain / loss at $900,000 sale		
Return at $900,000 sale (%)		
A3 · Interest shortfall in cash stress		

L14.A1 Under each plan, calculate normal-year interest, cash distributed to equity, net equity sale proceeds, total equity receipts, and the percentage return on initial equity.

L14.A2 Keep normal operating cash at $120,000. The factory now sells for $900,000. Calculate each owner’s dollar gain or loss and return. What changed about the factory’s operations between the financing plans?

L14.A3 Under the separate cash stress, calculate the interest shortfall, if any, for each plan. Identify two possible responses and explain why neither is automatically available.

L14.A4 The buyer now proposes to cut annual maintenance by $30,000 and distribute that saving immediately. What evidence would you request before treating the increase in cash as an improvement?

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 14 • MEETING 15 • REFLECT

Return to the question

Buying a company with debt

Worked example • Separate business and equity returns

A hypothetical company costs $200,000. The buyer uses $80,000 equity and $120,000 interest-only debt at 10%. One year's operating cash is $30,000; the business then sells for $220,000.

Interest is $12,000, leaving $18,000 operating cash for equity.

Sale proceeds after repaying debt are $220,000 - $120,000 = $100,000.

Total equity receipts are $118,000; gain is $38,000.

Equity return is $38,000/$80,000 = 47.5%. An all-equity buyer receives $250,000, a 25% return.

The percentage difference does not establish an operating improvement: the business is identical in both versions.

With the $1,200,000 sale, Plan A earns 32% and Plan B earns 65%. Plan A gains $320,000. Under B, owners gain $260,000 and the lender earns $60,000 interest, totaling the same $320,000. At a $900,000 sale, A's owners gain $20,000, or 2%. B's owners lose $40,000, or 10%, while its lender earns $60,000. The factory produced the same cash under both financing plans. Changing financing changed who received it.

The cash stress exposes the other side of the structure. Plan B owes $60,000 interest but generates only $40,000 before financing. The $20,000 shortfall requires resources or an agreement that the setup does not supply. Meanwhile, cutting maintenance could remove waste or create expensive failures later. A defensible acquisition judgment evaluates the operating plan, financing obligations, evidence, and distribution of gains and costs. It cannot be based only on the buyer's projected percentage return.

Discuss

• Why might lenders care about the path of cash receipts even if owners predict a high eventual sale price?

• Who could benefit from a merger that eliminates duplicated work, and who could bear its transition costs?

• What additional information would you need to separate operating improvement from a favorable change in market valuations?

TAKEAWAY An acquisition's equity return combines business performance, purchase and sale prices, and financing. Trace those components separately, then examine whether the operating plan creates lasting benefits and who bears its risks.

CHECK "A higher equity return proves the buyer created more value." Borrowing changes the size and risk of the equity claim. Compare operating cash, debt obligations, and total business value before attributing a return difference to better management.

UNIT 5 • LESSONS 15-18 • MEETINGS 16-19

Mortgages, structured credit, and 2008

A mortgage begins with a household and a home, but the right to receive its payments can travel through the financial system. We will trace those payments, examine how losses are divided, and consider what happens when lenders want their money back quickly.



The mortgage is a household debt. Whoever owns the loan holds the claim on its future payments.

The lessons ahead

15. From mortgages to securities
16. Who takes the first loss?
17. When overnight lenders leave
18. 2008: intervention and tradeoffs

Questions to carry into class

- What changes when a lender sells the right to receive mortgage payments?
- Who takes a loss first, and when can that protection run out?
- What tradeoffs arise when officials respond to a financial emergency?

> **KEEP THE CONNECTION**
>
> We return to the distinction between cash shortages and losses. The 2008 case brings both into a discussion of costs, incentives, and effects on other people.

R LESSON 15 • MEETING 16 • UNIT 5 • READ / BEFORE THIS LESSON

From mortgages to securities

How can one home loan become part of someone else's investment?

Imagine a lender that has financed homes in one town. Its borrowers will make payments for years, but more families want loans next month. The lender could wait for the first loans to be repaid or sell the right to receive their payments. If a loan is sold, who has to move out of the house? Nobody. The household still owns its home and owes the debt. What changes hands is the claim on its future payments.

In everyday speech, a mortgage is a loan secured by real estate. If a borrower fails to pay, the lender may pursue the collateral through the applicable legal process. Collateral can reduce a loss, but a house cannot always be sold quickly or for enough to repay the loan. A mortgage payment usually includes interest, which compensates the lender, and principal, which reduces the amount borrowed. Taxes and insurance may also appear on a household bill; we will leave those out of our examples.

Securitization means placing financial assets into a pool and issuing securities supported by their cash flows. A mortgage-backed security, or MBS, gives an investor a claim tied to a mortgage pool. A servicer collects payments and administers loans. The servicer may be different from the institution that originally made the loan and from the investors who ultimately receive the money. Keeping these roles distinct helps us follow both the cash and the incentives.

For a simple example, suppose a pool receives $1,000 this month: $700 of interest and $300 of principal. Before fees, investors collectively receive $1,000, but only $700 is interest income. The remaining $300 repays part of the borrowers’ loan principal. What an investor paid for that claim is a separate amount. They should not count the entire payment as profit. If one household pays late, cash may arrive later; if part of a debt is never recovered, there is a credit loss. Those are different events.

Another uncertainty is prepayment: a borrower may repay early, perhaps by refinancing. Early repayment returns principal sooner but ends future interest on that principal. Pooling many loans can reduce dependence on one household, while a common economic shock can still affect many households together. The contract determines who bears these risks and whether any guarantee applies. Before class, consider: what would you want to know about a mortgage pool before buying a share of its payments?

No written response required. Bring your initial judgment to the discussion.

E LESSON 15 • MEETING 16 • EXPLAIN

How it works

From mortgages to securities

In 1970, Ginnie Mae first guaranteed a security backed by a pool of home mortgages. The pool connected two groups with different needs. A local lender could sell long-term mortgage claims and use the proceeds to finance more homes. Investors could buy securities tied to payments from many households. In our simplified transaction, the lender originates the mortgages and sells them to a trust. The trust owns the loans and issues the investor claims.

Our classroom pass-through distributes each month's available collections in proportion to investors' ownership after a stated servicing fee. Follow the accounting in two columns: interest and principal. Fees reduce what reaches investors. Principal payments reduce the pool's outstanding loan balance. A payment that is late produces a current cash shortage, but does not establish the final loss. We need information about later collection and collateral recovery before calculating a permanent credit loss.

Prepayment changes timing even when the borrower pays everything owed. If a borrower repays $20,000 early, the pool now holds cash instead of that $20,000 mortgage claim. Future interest from that claim stops. Whether early repayment helps a particular investor depends on the purchase price, expected timing, and reinvestment opportunities. The same event need not help every investor.

A loan sale can also change incentives. An originator paid for each new loan has reason to care about volume. Investors need borrowers who will repay. Checking income, requiring the seller to stand behind specified promises, or leaving the seller exposed to some losses can bring those interests closer together. Some mortgage securities carry guarantees and others do not. For today's calculations, assume there is no guarantor and no one advances a missing payment.

Follow the claim and the cash

Party	What changes hands
Household	Receives loan; promises future payments
Originator	Makes loan; may sell the mortgage claim
Pool or trust	Owns loans; issues investor claims
Servicer	Collects and administers payments
Investor	Provides funds; receives contracted cash flows

Simplified structure. One firm may perform multiple roles; its responsibilities still differ.

Sources: S37, S38, S39.

T LESSON 15 • MEETING 16 • TRY / 15 MINUTES

Separate income from returned principal

Pairs; one person traces cash, the other checks balances, then switch.

All figures are hypothetical. A pool starts with ten mortgages, each with $100,000 outstanding. Each normally pays $600 this month: $400 interest and $200 principal. A flat $100 servicing fee is deducted from aggregate interest collections. An investor owns 20% of every pool cash flow. Assume no guarantee, no taxes, no other costs, and no principal loss unless explicitly stated. For Questions 1-2 everyone pays normally. In Question 3, use a separate alternative: one borrower pays nothing this month; the other nine pay normally and the full fee still applies. In Question 4, instead use normal payments plus an additional $10,000 principal prepayment.

Each row is a separate monthly scenario. Record dollars. The holder receives 20% of pool cash flows after the servicing fee.

Scenario	Holder net interest	Holder principal	Holder total cash	Ending pool principal
A1–2 · Normal				
A3 · One late				
A4 · Extra principal				

L15.A1 Find total collections, net interest, principal returned, and the pool's ending principal balance under normal payments.

L15.A2 How much cash does the 20% investor receive? Separate net interest from principal.

L15.A3 Under the missed-payment alternative, find investor cash and pool principal still outstanding. What can and cannot be concluded about the eventual credit loss?

L15.A4 Under the prepayment alternative, find investor cash and the pool's ending principal balance. Explain why the extra cash is not extra interest income.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 15 • MEETING 16 • REFLECT

Return to the question

From mortgages to securities

Worked example • A small pass-through

Hypothetical pool: four loans each pay $800 this month, including $300 principal. Total servicing fee is $80. An investor owns 25%.

Gross collections = 4 × $800 = $3,200.

Principal returned = 4 × $300 = $1,200.

Net interest = $3,200 - $1,200 - $80 = $1,920.

Investor receives 25% × $3,120 = $780: $300 principal and $480 net interest.

Of the $780 receipt, $300 repays loan principal and $480 is net interest. The investor's return also depends on the price paid, other cash flows and ending value.

The household, loan originator, servicer, and security investor have different roles. A useful analysis follows the claim as well as the cash. In our pool, ordinary collections contain both net interest and repayment of mortgage principal. The investor's purchase price is a separate amount. An interruption in collections raises a timing problem first; its final loss depends on later events. Early repayment creates a different issue: principal returns promptly, but some anticipated future interest disappears.

Securitization can help finance useful lending and spread exposures among investors. Its quality depends on the loans, contracts, information, and incentives involved. The final cash flows still come from households and any applicable guarantees. Changing ownership does not make those resources unlimited. In the next lesson, investors will receive different priorities rather than equal shares, and we will ask how that changes who absorbs a loss.

Discuss

- Why might a pension fund be willing to own claims that a mortgage originator wants to sell?
- What information would help an investor judge whether loan screening was careful?
- Can an investment return all principal and still produce a disappointing return? Explain how timing matters.

TAKEAWAY A mortgage-backed security is a claim on specified cash flows. Trace principal, interest, fees, timing, and any guarantee separately before deciding what an investor has earned or what risk remains.

CHECK A monthly distribution is not entirely profit. It can include returned principal. A late payment is also not automatically a permanent loss: final recovery may be full, partial, or zero. Our activity separates these possibilities rather than treating them as interchangeable.



R LESSON 16 • MEETING 17 • UNIT 5 • READ / BEFORE THIS LESSON

Who takes the first loss?

Can risky loans support a safer claim without making every claim safe?

Three fictional investors want to finance the same pool of loans, but they do not want the same bargain. One wants priority in receiving repayment. Another is willing to take the earliest losses if the possible compensation is attractive. A third prefers a position between them. They can divide the pool into different claims rather than each owning the same proportional share. The borrowers' debts do not change when the investors negotiate these priorities.

Each class of claims is called a tranche. The senior tranche has priority over specified junior claims. The junior or first-loss tranche absorbs losses before protected classes do. A waterfall is the contractual rule that determines how available money is distributed. Think about an ordered line of claims, not separate buckets of loans: several investor classes can depend on the same underlying pool.

Suppose a simplified pool contains $100 of principal and issues a $70 senior claim, a $20 middle claim, and a $10 first-loss claim. Ignore interest, fees, and time. If the pool ultimately returns $95, its loss is $5. The senior investor can receive $70 and the middle investor $20, leaving $5 for the first-loss investor. The pool lost $5, and investors together lost exactly $5. Their losses are unequal because their contracts are unequal.

This arrangement can make the senior claim less exposed to moderate credit losses than a proportional share of the whole pool. It does not make the junior claim safer. It also does not guarantee the senior claim against every possible loss. Protection depends on the amount beneath it and on how badly the pool performs. A credit rating is an opinion about credit risk under a methodology, not a source of cash that pays creditors.

Correlation matters because a common shock can hurt many borrowers together. A small loss in every region is different from assuming that only one household will have trouble at a time. A larger pool can still contain concentrated exposure to house prices, jobs, or refinancing conditions. As you prepare for class, consider: what would have to happen before the senior investor in this $100 example loses any principal?

No written response required. Bring your initial judgment to the discussion.

E LESSON 16 • MEETING 17 • EXPLAIN

How it works

Who takes the first loss?

In this one-period exercise, every dollar the pool recovers goes first to senior principal, then to middle principal, then to junior principal. Losses reach the claims in reverse order. We count only final principal and ignore interest, fees, guarantees, and timing.

The $10 junior claim and $20 middle claim protect $70 of senior principal against the first $30 of pool losses. At exactly $30 of losses, both cushions are gone, but the senior investor still gets $70. If losses reach $31, the senior investor gets $69.

Changing priority divides a given loss differently. It leaves the borrowers and the amount they repay untouched. With the same $100 pool, with the middle claim held fixed, a larger junior cushion requires more junior financing and leaves room for less senior financing.

A senior investor needs to know how often losses might cross that $30 threshold. If borrowers depend on the same employers or housing market, losses may arrive together. Calculate the senior loss in each possible outcome before taking its average.

Who absorbs the loss?

Pool loss	Junior loss	Middle loss	Senior loss
$5	$5	$0	$0
$25	$10	$15	$0
$30	$10	$20	$0
$40	$10	$20	$10

Hypothetical $100 pool from the worked example. Losses sum across every row; figures are principal only.

Shading shows the $25 of loss across a $100 pool, from left to right.



Sources: S38, S37.

T LESSON 16 • MEETING 17 • TRY / 15 MINUTES

Stress the waterfall

Groups of three; one student represents each tranche.

A hypothetical $1,000 mortgage pool is financed by senior principal of $700, middle principal of $200, and junior principal of $100. All amounts are principal only. At the end of one period, distribute recoveries to senior first, middle second, and junior last, up to each original claim. Ignore interest, fees, taxes, guarantees, and payment timing. Evaluate three separate loss scenarios: A loses $60; B loses $235; C loses $400. Later consider two equally likely scenarios, either zero loss or $400 loss. These probabilities are stipulated for the exercise and are not estimates of actual mortgage performance. Each investor may receive less than its original principal.

Amounts are dollars. For Case B fill recoveries first. For each tranche, loss + recovery must equal its starting claim.

Pool loss	Junior loss $100 claim	Junior recovery	Middle loss $200 claim	Middle recovery	Senior loss $700 claim	Senior recovery
A · $60						
B · $235						
C · $400						

L16.A1 For B, calculate each tranche’s recovery first and loss second. Then complete A and C. Check that each loss/recovery pair equals its original principal and that total losses equal the pool loss.

L16.A2 At what pool loss is senior principal first affected? Explain what happens at exactly $300 of loss.

L16.A3 In the 50-50 zero-or-$400-loss model, find expected pool loss and expected senior loss. Why does applying the waterfall only to expected pool loss give the wrong senior answer?

L16.A4 A proposal replaces $100 of senior financing with an additional $100 junior layer, leaving the middle layer unchanged. Recalculate senior loss in C and identify who must accept a different financing bargain. Compare the dollars senior receives under the old and new structures. How much did senior originally provide in each?

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 16 • MEETING 17 • REFLECT

Return to the question

Who takes the first loss?

Worked example • A threshold is not a guarantee

Hypothetical $100 pool; senior $70, middle $20, junior $10. Final recoveries are $75. Ignore interest and costs.

Pool principal loss = $100 - $75 = $25.

Junior loses $10; its recovery is $0.

Middle loses the next $15; its recovery is $5.

Senior loses $0; its recovery is $70.

Recoveries sum to $75 and losses to $25. Senior remains whole because $25 has not exhausted the $30 beneath it.

In this model, priority can protect senior principal against moderate losses because other investors absorb those losses first. Under the severe scenario, the same protection runs out. Every dollar of pool loss appears somewhere among the claims, and no tranche can lose more principal than it originally provided. The waterfall is an accounting rule; predicting the frequency of each loss scenario requires a separate model.

The expected-loss activity reveals why averages can hide important outcomes. Senior losses depend on crossing a threshold. We must calculate the senior loss in each scenario and then average those losses, rather than feed the average pool loss through the threshold once. The same distinction appears in option payoffs and stress tests. A safer senior claim is a possible contractual result; a universally safe security is not established by its senior label.

Discuss

• What evidence could justify treating the senior claim as less risky than a proportional share of the pool?

• Why might two mortgage pools with the same average default rate have different chances of exhausting their junior layers?

• What should an investor ask about a favorable rating besides the letter grade?

TAKEAWAY Priority can make one claim safer by placing losses on other claims first. Test the full range of plausible pool losses and check every allocation; a favorable average does not rule out a damaging tail.

CHECK Senior does not mean loss-free. It identifies priority under a contract. Nor does a pool's expected loss determine the senior tranche's expected loss by itself: the distribution of outcomes and the loss thresholds matter, as the two-scenario exercise shows.

R LESSON 17 • MEETING 18 • UNIT 5 • READ / BEFORE THIS LESSON

When overnight lenders leave

How can financing disappear before the underlying loans reach their final outcome?

On Thursday, March 13, 2008, Bear Stearns told the Federal Reserve that it expected to run short of cash or funding the next day. It had reported nearly $400 billion in assets. How could a firm that large have trouble making Friday's payments? To see one way this can happen, follow a fictional dealer that owns mortgage securities it expects to collect on for years. Its own borrowing comes due tomorrow morning.

The dealer uses a repurchase agreement, or repo. It sells securities for cash and agrees to buy them back at a specified price and time. Economically, the securities act as collateral for a loan. The lender usually advances less than the securities' assessed value. The difference, measured as a fraction of that value, is the haircut. A larger haircut gives the lender more protection and leaves the dealer to find more funding elsewhere.

Suppose collateral is valued at $100 and the haircut is 10%. A lender provides $90, leaving the dealer to finance the other $10. Tomorrow, the dealer needs to repay or renew that $90, plus any interest. If the collateral is then valued at $95 and the haircut stays at 10%, a new loan provides only $85.50. Ignoring interest, the dealer needs $4.50 from another source. No final mortgage default has to occur before this refinancing gap appears.

A lender could also demand a larger haircut or refuse to renew at all. These are distinct changes. Raising the interest rate does not necessarily persuade a lender that is unwilling to accept the collateral or the borrower's risk. The dealer might use spare cash, raise new capital, borrow elsewhere, or sell assets. If many dealers try to sell similar assets together, sale prices may fall, worsening other firms' funding conditions.

This is one way a run can occur without households lining up outside a bank. Large financial institutions can withdraw short-term financing from other institutions. However, different funding markets behaved differently during the financial crisis; not every run was a gradual increase in haircuts. As you read, consider: what information would you need to decide whether an overnight lender should renew a dealer's financing tomorrow?

No written response required. Bring your initial judgment to the discussion.

E LESSON 17 • MEETING 18 • EXPLAIN

How it works

When overnight lenders leave

New borrowing capacity equals collateral value times one minus the haircut. Subtract the new loan from the old payment due to find the gap before spare cash. A lower collateral price and a larger haircut can each produce a gap. The full old obligation is due in every case. With no renewal this lender supplies $0 toward repayment.

A lender may fear being left with securities it cannot sell. A dealer with valuable long-term assets can run out of cash before those assets pay. It can also have losses that will never be recovered. The lender needs evidence about both timing and value.

On Friday, March 14, the New York Fed lent Bear Stearns $12.9 billion through JPMorgan Chase. The bridge loan gave Bear the weekend to seek a way forward. On Sunday, Bear accepted JPMorgan Chase’s offer to merge. The bridge loan was repaid with interest on Monday. The acquisition involved a separate financing arrangement.

In tri-party repo, a third party helps settle the trade. New York Fed Staff Report 506 finds stable margins and funding for most tri-party borrowers during the crisis, with a sharp decline in Lehman funding. It compares that evidence with haircut increases found in a segment of bilateral repo. The findings concern particular market samples. Our classroom haircut changes are invented.

Separate $200 starting-collateral example

Change	Effect on new financing	Question to ask
Lower collateral value	Smaller loan at same haircut	How was value measured?
Larger haircut	Smaller loan at same value	What cushion is demanded?
No renewal	No new loan from this lender	What replacement exists?

A forced sale is one possible response to a funding gap. Its price determines whether selling creates an additional loss.

How much of the $180 due tomorrow can be refinanced?



At a $180 collateral value, borrowing falls from $162 with a 10% haircut to $144 with a 20% haircut.
Sources: S40, S41, S42.

T LESSON 17 • MEETING 18 • TRY / 15 MINUTES

Tomorrow morning's funding gap

Pairs; calculate independently first, then reconcile and defend a financing decision.

A fictional dealer owns securities initially valued at $1,000, financed by an overnight repo loan of $900. It also holds $40 of unpledged cash. Ignore interest, taxes, fees and other assets or debts. Tomorrow the old $900 is due. Securities are marked at $920 in all three separate cases. In A the new haircut is 10%. In B it is 20%. In C no lender renews; only in C, a buyer offers $850 for the whole portfolio. Assume the repo lender releases the securities at settlement in exchange for all available proceeds and cash. Any unpaid debt remains due. No other resources are available. These are alternatives, not successive days.

Record dollars. A and B offer renewal funding; C has no renewal and proceeds to the sale. "—" means no sale is assumed in that case.

Funding calculation	A · 10% haircut	B · 20% haircut	C · No renewal
Collateral value used			
Old repo debt due			
New borrowing			
Gap before using cash			
Unpledged cash used			
Gap after cash, before sale			
Sale proceeds	—	—	
Unpaid debt after sale	—	—	

L17.A1 In A, label the collateral value used to calculate new borrowing capacity. Find the gap before using cash and the amount still missing after using $40.

L17.A2 Repeat for B, labeling the collateral value. Separate the extra haircut's effect from the price decline already present in A.

L17.A3 In C, first find the funding gap after using $40 but before any sale. Then sell the portfolio for $850 and apply all available cash to the $900 due. Find the remaining unpaid debt and ending equity before any creditor concession.

L17.A4 Choose a precaution the dealer could have arranged before the crisis. Explain how it changes the funding problem and identify a cost or limitation.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 17 • MEETING 18 • REFLECT

Return to the question

When overnight lenders leave

Worked example • Two inputs can change

Hypothetical collateral is worth $200 with a 10% haircut. Tomorrow its assessed value is $180 and the haircut becomes 20%. Ignore interest.

Original loan = $200 × 0.90 = $180.

New borrowing capacity = $180 × 0.80 = $144.

Funding gap = $180 - $144 = $36.

With value unchanged at $200, the larger haircut alone would produce a $20 gap.

The $36 combined gap reflects both lower value and a larger haircut; it is not a $36 final loss on the underlying loans.

The activity begins with a price change and ends with different funding outcomes. Case A leaves a shortage even after the dealer uses its cash. Case B makes that shortage larger without any additional decline in collateral value. In Case C, the stipulated sale price is too low to cover the debt, so the forced sale leaves a deficit. A lender's cushion is not spare cash available to the borrower.

These mechanisms help explain why the timing of obligations matters. A firm may need financing long before the final performance of its mortgage securities is known. More cash, longer borrowing terms, and lower debt can improve resilience, but they use resources and can reduce returns in ordinary conditions. The challenge is to judge whether the price of that resilience is justified before the funding shock arrives, rather than declare the answer obvious afterward.

Discuss

- Why might an overnight lender decline a higher interest rate rather than renew?
- How can one firm's sensible decision to sell affect another firm's collateral valuation?
- What evidence would help distinguish a temporary funding shortage from an asset value below the debts owed?

TAKEAWAY Funding risk concerns when obligations come due and whether replacement cash is available. Calculate collateral value, haircut, renewal terms, and spare cash separately before deciding whether a firm can survive until its assets pay.

CHECK Collateral does not guarantee that financing will continue. A lender may reject the collateral or stop lending entirely. Haircuts also did not rise uniformly across all repo markets in 2008; some funding withdrawals were sudden quantity changes rather than gradual price adjustments.

R LESSON 18 • MEETING 19 • UNIT 5 • READ / BEFORE THIS LESSON

2008: intervention and tradeoffs

When should protecting the financial system involve helping a failing institution?

On September 15, 2008, Lehman Brothers Holdings filed for bankruptcy. The next day the Federal Reserve authorized emergency credit for the insurer AIG. Why would officials facing two threatened failures in two days reach different decisions? They had to weigh the value of collateral, the chance of repayment, the available deals, and the trouble a sudden collapse could cause for others. Nobody could observe both the outcome of helping and the outcome of declining to help the very same firm.

A spillover is a consequence for people beyond the original transaction. A firm's failure can impose costs on other firms, workers, or customers through disrupted payments, asset sales, and reduced credit. These costs give policymakers a reason to consider intervention. They do not automatically prove that any particular intervention is justified. The scale of the spillover, the alternatives, the authority to act, and the distribution of costs all matter.

Different forms of support solve different problems. Emergency lending supplies cash that must be repaid; adequate collateral and repayment prospects matter. A capital investment provides funds in exchange for an ownership claim and can help absorb losses. A resolution process deals with failure and allocates losses while trying to preserve useful operations. Calling all three a bailout can hide differences in who takes risk and what the institution must give up.

For example, a fictional firm with assets worth $110 and debt of $100 might need temporary cash because its assets cannot be sold quickly. A second firm has assets worth only $90 and debt of $100. Lending the second firm $10 adds $10 cash and $10 debt: assets become $100 and liabilities $110. Its $10 deficit has not disappeared. A cash loan can buy time, but by itself it does not repair a loss already embedded in the balance sheet.

Another concern is moral hazard: protection against losses can change incentives to take risks beforehand. Conditions, fees, shareholder losses, and management changes may reduce that concern, while poorly designed conditions can create other problems. Reasonable people can disagree about the best response under uncertainty. Before class, consider: which facts would most strongly change your decision between lending temporarily, demanding new capital, arranging a sale, and allowing a firm to fail?

No written response required. Bring your initial judgment to the discussion.

E LESSON 18 • MEETING 19 • EXPLAIN

How it works

2008: intervention and tradeoffs

AIG already needed cash to post additional collateral as mortgage-related asset prices fell, and it struggled to borrow privately. On September 16 the Fed authorized a secured credit facility of up to $85 billion. The announced terms gave the U.S. government a right to a 79.9% equity interest. The credit ceiling was neither an immediate $85 billion payment nor a final loss. Later arrangements changed.

On October 14, Treasury announced its Capital Purchase Program. Treasury would buy preferred shares in qualifying institutions. These shares had priority over common shares and carried dividends. This was an equity investment. A Federal Reserve loan instead creates a debt the recipient must repay. A particular intervention can combine several tools, as the initial AIG terms illustrate.

An evaluation should separate four questions. What problem is being addressed: missing cash, insufficient capital, or a failing business? What would the alternative probably do to other people? Who supplies funds and who receives any upside? What incentives does the intervention create for future decisions? A program can reduce immediate harm while raising longer-term concerns. It can also impose losses on shareholders while protecting a useful service.

Our policy activity uses fictional estimates and stipulated powers so that you can compare options transparently. Expected monetary cost is one useful measure, but it is not a complete social judgment. A rare severe loss, unequal burdens, unreliable estimates, or credibility effects may change a decision. Treat estimates as assumptions to test. Avoid claiming to know the exact outcome of the historical path that was never taken.

Four events, different tools

Date in 2008	Event	Instrument or outcome
March 16	Bear acquisition agreement	Fed-supported private acquisition
September 15	Lehman parent files for bankruptcy	Failure through bankruptcy
September 16	AIG assistance announced	Fed credit facility plus public equity interest
October 14	Capital Purchase Program	Treasury announces preferred-share purchases

Historical timeline. The table identifies actions, not a claim that the firms or available choices were equivalent.

Sources: S42, S43, S44, S45, S46, S47, S48, S49.

T LESSON 18 • MEETING 19 • TRY / 15 MINUTES

An emergency decision with imperfect information

Groups of four or five; assign a lender, taxpayer, customer, shareholder, and chair where possible.

A fictional authority has three lawful options for a troubled payments firm. A: no support, with a 40% chance of $100 million disruption losses to others and 60% chance of zero. B: a secured $50 million loan, with a 10% chance of $20 million net public credit loss and 90% chance of zero; no disruption losses. C: an orderly transfer costing the public $8 million with certainty, plus $5 million disruption losses. For the quantified comparison, add all stipulated public costs, including net credit losses, plus disruption losses to others, counting each dollar equally. All costs are measured in today’s dollars and do not overlap. Ignore interest and administration. Estimates are stipulated, not historical. All options leave some future incentive effects unpriced. Under B, shareholders retain ownership; under C, their existing equity is wiped out.

L18.A1 Calculate expected quantified cost for each option. Separate the loan's $50 million gross advance from its expected net credit loss.

L18.A2 Recommend an option using the supplied estimates. Identify one reason a decision-maker might reasonably prefer another option.

L18.A3 For B, hold the $20 million loss severity fixed. What loss probability makes its expected quantified cost equal to C's? Explain the comparison's limit.

L18.A4 Propose two conditions on B that address incentives or public exposure. Identify at least one possible downside, and name one missing fact you would seek before acting.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 18 • MEETING 19 • REFLECT

Return to the question

2008: intervention and tradeoffs

Worked example • A loan is not new equity

Hypothetical firm: assets $80, debt $90. A public lender advances $15 cash. Ignore interest and valuation changes.

Before the loan, equity = $80 - $90 = -$10.

The loan increases assets to $95 and debt to $105.

After the loan, equity = $95 - $105 = -$10.

An additional owner investment of $20 cash, unlike a loan, would add assets without adding debt.

The loan supplies cash and leaves the $10 equity deficit in place. A $20 equity investment would turn that deficit into $10 of positive equity.

Under the activity's stated estimates, the loan has the lowest expected quantified cost. That is a conditional result, not a universal argument for lending. A policy-maker could reasonably prefer the transfer because it removes current shareholder protection and may reduce future incentive problems. Another might doubt the loan's loss estimate or worry about the authority's capacity to enforce conditions. Strong answers identify exactly which assumption or value changes the decision.

The 2008 cases show why institutional details matter. Lending, supported acquisition, bankruptcy, and capital investment have different effects on owners, creditors, customers, and the public. The important habit is to name the mechanism, compare realistic alternatives, and state who bears the risk. We should assess decisions with the information available when they were made, while using later evidence to improve future decisions.

Discuss

• Should a response that protects customers also protect existing shareholders? Why might those objectives come apart?

• Does eventual repayment prove that a public intervention involved no risk when it was made?

• Which claims about the 2008 alternatives can be supported by evidence, and which remain counterfactual judgments?

TAKEAWAY Evaluate intervention by the problem it addresses, the realistic alternative, the distribution of losses and gains, and the incentives it creates. A low expected cost is informative, but its assumptions and omitted consequences must remain visible.

CHECK A loan's gross amount is not automatically a public loss, and eventual repayment does not prove the original risk was zero. Lending also does not by itself repair negative equity: it adds an asset and a liability to the recipient.

UNIT 6 • LESSONS 19-22 • MEETINGS 20-23

Models, incentives, and financial failure

A convincing plan can depend on more than the expected outcome. It may also depend on time, financing, and trustworthy information. Long-Term Capital Management and Enron give us cases for testing those assumptions before we design safeguards of our own.



Illustration of a late-1990s trading desk. A forecast could be right about prices and wrong about how long lenders would wait.

The lessons ahead

19. A trade that should converge
20. LTCM: surviving until convergence
21. Enron: earnings, cash, and trust
22. Design a system that can withstand stress

Questions to carry into class

- Could a position run out of funding before an expected price change occurs?
- What would you check before relying on reported profits or a strong reputation?

R LESSON 19 • MEETING 20 • UNIT 6 • READ / BEFORE THIS LESSON

A trade that should converge

Can a sensible forecast become a losing trade before it comes true?

A trader notices two investments with similar promised payments but different prices. One costs $48 and the other costs $52. Perhaps one is temporarily unpopular. If their prices eventually become equal, buying the cheaper investment looks attractive. But buying it alone also exposes the trader to a general market decline. A convergence trade tries to profit from a narrowing price difference while offsetting some common movements. Similar promised payments do not establish that two securities are equally risky.

The trader takes a long position by buying the cheaper investment. To take the other side, the trader borrows the more expensive security from an owner, sells it, and later must buy a replacement to return. This is a short sale. Selling the borrowed security for $52 and replacing it for $50 earns $2 before expenses. Replacing it for $58 loses $6. The obligation is to return the security, not merely the original sale proceeds. Borrowing fees and collateral requirements matter.

Suppose the cheaper security rises from $48 to $50 while the expensive one falls from $52 to $50. The long side earns $2 and the short side earns $2. The combined gain is $4 before costs. Now consider a different path: the cheaper one first falls to $44 while the expensive one rises to $56. Each side loses $4 at that point. Even if both prices later reach $50, the trader needs cash to meet a collateral demand today.

A related idea is carry: income earned while a position is held, less its financing and holding costs. A bond might provide $6 of annual interest while borrowing and other costs total $4, leaving $2 of positive carry before changes in the bond price or credit losses. Positive carry is not the same thing as a safe total return. A price decline can exceed years of income, and borrowing costs can change.

A useful forecast therefore needs a funding plan and a reason the expected relationship should persist. Investors can disagree about fair value, the date of convergence, and the amount of money needed to survive the intervening path. Tomorrow we will follow both sides of one simplified trade. What must remain true for a trader to wait long enough for a promising price gap to close?

No written response required. Bring your initial judgment to the discussion.

E

LESSON 19 • MEETING 20 • EXPLAIN

How it works

A trade that should converge

Keep separate accounts for the long and short positions. With no interest or dividend payments on these securities, the long position gains the sale price minus the purchase price. The short gains the original sale price minus the replacement price. Add the two and subtract the stated costs. In this activity the cash from selling B short is held as collateral. It cannot fund the purchase of A, and the fund still owes the lender 20 units of B.

If the cheaper security is A and the expensive security is B, define the gap as price of B minus price of A. For equal quantities, a reduction in this gap creates a gross trading gain. The two prices need not end at their starting midpoint: they could both rise or both fall. The important calculation is the change in the gap. Unequal position sizes would alter that relationship.

The mechanism can serve a useful purpose by directing demand toward a relatively cheap claim and adding supply to an expensive one. Yet similarity is an assumption to investigate. Different default exposure, settlement terms, liquidity, or options can justify a persistent price gap. A strategy that expects convergence is not automatically an arbitrage with a guaranteed profit.

Collateral protects lenders against losses while a position is open. An unfavorable price move can produce a cash demand even without a completed sale. The classroom threshold is a fictional contract, not a statement of market regulations. Real positions can also face security recalls, changing borrowing fees, and trading costs. A correct long-run view can coexist with an unaffordable short-run path.

One unit, two obligations

Position	Opening transaction	Closing transaction
Long A	Pay to buy A	Sell A and receive cash
Short B	Borrow B, then sell it	Buy B, then return it
Restricted proceeds	Cash held as collateral	Released after obligations
Carry costs	Accrue while waiting	Deduct from trading profit

Conceptual transaction map. Holding costs and collateral terms must be specified separately.

Sources: S50, S51.

T LESSON 19 • MEETING 20 • TRY / 15 MINUTES

The gap widens first

Pairs: one partner tracks A and the other tracks B, then reconcile.

Hypothetical fund: buy 20 units of A at $98 and short 20 borrowed units of B at $102. A cash loan pays the full purchase of A. Short-sale proceeds remain restricted collateral. Owners contribute $500 cash as equity. It is available as collateral. Neither security pays interest or dividends while the trade is open. The total cost of closing the entire trade is a fixed $20, including all loan interest and fees; do not add other costs. At a stress checkpoint A is $99 and B is $109. If the fund closes at this checkpoint, use these quoted prices with the same single $20 all-in cost. The fictional contract requires at least $400 of equity after allowing for closing costs. Otherwise owners must add the shortfall immediately or close. A possible later outcome is A = B = $100, but it is not guaranteed.

Show signed dollar gains (+) and losses (−) for each leg. Deduct the single closing cost once from the combined trade.

Trade / account	A1 · Both reach $100	A2 · Checkpoint
Long A · signed profit / loss		
Short B · signed profit / loss		
Combined trading profit / loss		
Single closing cost		
Net trading profit / loss		
Contract equity after closing cost		

L19.A1 If both securities reach $100, calculate the long profit, short profit, and total net profit.

L19.A2 At the checkpoint, show the signed profit or loss on each position. How much equity is available under the contract after the single $20 closing allowance?

L19.A3 How much new equity is required to meet the $400 threshold? What happens if owners cannot supply it?

L19.A4 Would you add the required money? Identify one fact about the securities and one fact about the funding that you need before deciding.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 19 • MEETING 20 • REFLECT

Return to the question

A trade that should converge

Worked example • Both prices rise, but the gap closes

Hypothetical: buy 10 units of A at $40 and short 10 units of B at $46. Later A is $45 and B is $48. Total stated costs are $8.

Long profit: 10 × ($45 - $40) = $50.

Short profit: 10 × ($46 - $48) = -$20.

Gross profit: $50 - $20 = $30.

Net profit: $30 - $8 = $22.

The gap narrowed by $3. The trade earned $22 despite the loss on the short.

At the checkpoint the long gains $20 and the short loses $140. After the single $20 closing allowance, only $360 of equity remains. Owners must contribute $40 or close. If they close, later convergence cannot benefit them. If they add $40 and later close at A = B = $100, they receive $600 against $540 contributed, a $60 net profit. That later outcome is possible but uncertain.

Convergence trading can improve price relationships and compensate investors who bear temporary uncertainty. Its usefulness does not remove the need to investigate differences between the securities, the cost of borrowing, and the available reserve of cash. We will carry these questions into LTCM: What was the trade trying to earn? How large was it relative to capital? And what could force it to end before the expected payoff?

Discuss

- Could both prices fall and this trade still make money? Explain using the gap.
- Why might a lender demand collateral even when the trader remains confident?
- What evidence would distinguish a temporary price gap from a reasonable permanent difference?

TAKEAWAY A convergence forecast becomes an investable strategy only when the investor can fund the position, meet interim obligations, and withstand a plausible widening of the price gap without relying on guaranteed recovery.

CHECK Having one long and one short position does not make a trade risk-free. The positions can react differently, financing can change, and lenders may require cash before the forecast has time to succeed.

R LESSON 20 • MEETING 21 • UNIT 6 • READ / BEFORE THIS LESSON

LTCM: surviving until convergence

Why might several sensible individual exit decisions create a system-wide problem?

After Russia announced a debt moratorium in August 1998, investors sought assets they considered safer and easier to sell. Price gaps widened in several markets together. Some positions that Long-Term Capital Management (LTCM) expected to offset each other lost value together. By September 2 its partners reported a 52% loss for the year through August and sought new capital. Before deciding whether to invest, what would you need to know about its trades, borrowing, and lenders who could demand cash?

A counterparty is the person or institution on the other side of a financial contract. A fund may borrow from several banks and trade with several dealers. Each counterparty can examine its own exposure while missing how much the fund owes elsewhere. If the fund has promised collateral to many institutions, simultaneous demands can exceed its available cash. The individual contracts become connected through the same borrower.

LTCM began trading in 1994. Its traders sought to profit when price relationships moved back toward the levels they expected. To see why position size mattered, imagine a different fund with $100 of investments, $96 of debt, and $4 of equity. A $1 investment loss takes away a quarter of its owners' money. This small example illustrates leverage. It does not estimate LTCM's actual balance sheet.

Consider what happens if a lender demands repayment immediately. A fund with little cash may sell investments. A fire sale is an urgent sale under conditions that produce a poor price relative to an orderly transaction. When several investors sell similar holdings at once, the prices used to value other portfolios may fall too. Those losses can trigger further demands. The initial problem then spreads through both contracts and market prices.

A recapitalization changes a firm's capital structure. In LTCM's recapitalization, private firms supplied new equity. In other cases creditors may convert debt into shares without supplying new cash. New investors may demand control or a large ownership share. An orderly adjustment cannot erase the original losses, and intervention can affect future incentives. What information would lenders need to decide whether supplying new capital would cost them less than demanding immediate repayment?

E LESSON 20 • MEETING 21 • EXPLAIN

How it works

LTCM: surviving until convergence

An equity cushion and a cash cushion do different jobs. Equity equals assets minus liabilities and absorbs valuation losses. Cash permits immediate payment without selling other assets. A fund can have positive equity but too little cash to satisfy a repayment deadline. It can also obtain cash from a sale while destroying part of its remaining equity through the sale discount.

For the activity, first mark the securities down, then calculate the cash needed for repayment. Selling an asset for its carrying value exchanges one asset, securities, for another, cash. Selling at a discount reduces both total assets and equity. Repaying debt at face value then reduces cash and debt by equal amounts. The repayment itself leaves equity unchanged.

On September 23, 1998, fourteen private financial firms agreed to recapitalize LTCM. On September 28, they contributed about $3.6 billion. The New York Fed had brought firms together because officials feared that simultaneous sales would drive down prices for others. It put no Federal Reserve funds at risk. Investors still had to decide whether official involvement might shape expectations of help in a future crisis.

A lender may accept a coordinated arrangement because immediate liquidation could reduce its own recovery. It may also worry that other lenders will exit first. Analysis therefore needs both the fund's balance sheet and the network around it. The argument for coordination concerns the timing and spread of losses; the objection concerns incentives, unequal treatment, and whether participants will expect similar help later. Neither argument proves that the investments were ultimately sound.

Historical anchors and classroom distinctions

Item	What is established
1994	LTCM begins trading
September 2, 1998	Partners report 52% year-to-date loss through August
September 23	Fourteen private firms agree to recapitalize LTCM
September 28	Consortium contributes about $3.6 billion
New York Fed	Convened discussions and supplied no capital

McDonough’s October 1998 testimony and GAO’s February 2000 report distinguish the negotiations from the transfer of funds.

Sources: S52, S53, S54, S55.

T LESSON 20 • MEETING 21 • TRY / 15 MINUTES

Repay now or restructure?

Groups of three: fund manager, lender, and independent reviewer.

All amounts are in millions of dollars. Hypothetical Fund F starts with securities worth 100, no cash, debt of 96, and equity of 4. First, security values fall 2%. Next, lenders require repayment of 8. No new borrowing or owner money is available. To raise that cash, F must sell securities currently carried at 10 for only 8; ignore other costs. Compare a redesigned fund that instead began with securities of 90 and cash of 10, financed by the same debt and equity. Apply the same 2% security-price decline and repayment demand. Cash does not lose value. Value all remaining securities at their post-decline carrying values.

Use millions of dollars. Complete the original fund's two stages separately, then the redesigned fund after the shock and repayment.

Balance-sheet item	Original after decline	Original after repayment	Redesigned after repayment
Securities			
Cash			
Total assets			
Debt			
Equity			

L20.A1 For the original fund, calculate assets and equity immediately after the 2% decline. What percentage of starting equity was lost?

L20.A2 Complete the original fund's balance sheet after the forced sale and debt repayment. Explain the additional loss.

L20.A3 For the redesigned fund, calculate assets, cash, debt, and equity after the shock and repayment. What did the cash buffer accomplish?

L20.A4 Return to the moment after the price decline, before lenders demand 8. As a lender, would you insist on the payment or negotiate more time? Give two facts you need. Explain how your choice could change another lender's or the manager's behavior.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 20 • MEETING 21 • REFLECT

Return to the question

LTCM: surviving until convergence

Worked example • One price move, two return measures

Hypothetical fund: $200 of securities, $180 of debt, and $20 of equity. Securities fall 5%; debt does not change.

Asset loss: 0.05 × $200 = $10.

Remaining assets: $190; debt: $180.

Remaining equity: $190 - $180 = $10.

Equity return: -$10 ÷ $20 = -50%.

A 5% decline in assets removes half the owners' equity before any forced sale.

The original classroom fund loses half its equity in the initial price move and the remainder in the forced sale. The redesigned fund can meet the repayment from cash, preserving $2.2 million of equity under the stated scenario. The extra cash sacrifices some exposure to profitable securities in normal times. It does not protect the redesigned fund against every possible loss or withdrawal.

LTCM's case makes the interaction between positions and funding central. The consortium response allowed a coordinated adjustment; it was not a promise that investors would recover their original wealth. A useful model should be tested against larger shocks, less favorable financing, and simultaneous actions by other institutions. A scenario is a question about consequences, not a declaration of how likely that exact future is.

Discuss

• Why might a lender prefer coordination even if it cares only about its own recovery?

• What can a model miss when each position is evaluated separately?

• How can officials facilitate a private response without supplying public capital, and why might that distinction still leave policy questions?

TAKEAWAY A portfolio must survive both market losses and financing deadlines. Coordinated responses may reduce forced-sale damage, but they also distribute losses and influence expectations about who will receive help in the future.

CHECK LTCM was not recapitalized with Federal Reserve money. Private firms supplied the capital. Official facilitation still deserves scrutiny, but it should not be described as a public cash injection or as eliminating the original investors' losses.

R LESSON 21 • MEETING 22 • UNIT 6 • READ / BEFORE THIS LESSON

Enron: earnings, cash, and trust

What would you ask before trusting an impressive profit figure?

A company announces a profitable year, yet asks its bank for more money. That is not automatically a contradiction or evidence of fraud. Imagine a repair business that finishes $1,000 of work in December but will be paid in January. It has earned revenue before receiving the cash. If it pays $700 of wages immediately, it can report a $300 profit while its bank balance falls by $700. Timing matters, and both figures tell a useful part of the story.

Accrual accounting records revenue and expenses according to the relevant recognition rules rather than simply when cash changes hands. A receivable is an amount a customer owes the business. In the repair example, the business has a $1,000 receivable until payment arrives. Estimates and judgment enter accounting, so readers should ask what supports the numbers. A disagreement about an estimate does not, by itself, establish dishonesty.

A cash-flow statement organizes cash movements by their source and use. Cash collected from customers belongs to operations in our example. Money received from a new bank loan belongs to financing. Either receipt increases the bank balance. Only the second one creates a debt that must be repaid. A manager who labels loan proceeds as customer receipts can show the correct cash total while giving investors the wrong impression about the business.

That distinction mattered at Enron. The SEC alleged in 2003 that linked contracts presented as prepaid commodity sales let Enron receive cash now and repay it later with interest. Commodity-price changes did not determine that repayment. A genuine customer can pay now for energy delivered later. A lender had to read the contracts together to identify the promise. Enron filed for bankruptcy in December 2001. Our activity uses a fictional company with simpler records.

Incentives also shape what people investigate. A manager may be rewarded for reported profit, a lender may care about repayments, and an employee may hold company shares. Information advantages are not all improper: careful analysis of public information is different from misuse of confidential information. The legal rules depend on circumstances. Before hearing the outcome of a company's story, what evidence would help you decide whether its reported success is supported by cash, enforceable claims, and candid disclosure?

No written response required. Bring your initial judgment to the discussion.

E

LESSON 21 • MEETING 22 • EXPLAIN

How it works

Enron: earnings, cash, and trust

Use three distinct questions when reading a report: What performance is claimed? What cash actually moved? What obligations remain? A legitimate sale on credit can create profit and a receivable without immediate cash. A new loan supplies cash and increases debt without creating revenue. Neither a profit figure nor a cash balance alone answers all three questions.

In our simplified activity, all expenses are current cash operating costs and there are no taxes, depreciation, capital purchases, or other transactions. That removes accounting adjustments which would be necessary in a real report. The gap between revenue and collections becomes the increase in receivables. The ending cash balance can be reconciled exactly using the operating and financing flows.

A genuine customer can pay today for energy delivered later. In the transactions challenged by the SEC, linked contracts let Enron receive cash now and repay it later with interest, without commodity-price changes determining repayment. Read those contracts together. These are the SEC’s allegations. Separately, the Justice Department documents a jury’s 2006 fraud conviction of Jeffrey Skilling. That verdict does not establish every allegation about every Enron transaction.

A special-purpose entity can legitimately isolate a project or allocate claims, as in Lesson 13. A new company name does not by itself transfer economic risk. Ask who supplies the capital, who guarantees repayment, who controls decisions, and whether losses can return to the sponsor. Independent review, transparent disclosure, and compensation tied to durable performance can improve scrutiny. They still depend on people having reliable information and acting on it.

Same cash balance, different economic meaning

Transaction	Cash effect	Other effect
Collect payment for work	Cash increases	Receivable falls or revenue arises
Borrow from a bank	Cash increases	Debt increases
Owner invests money	Cash increases	Owner equity increases
Pay this period's wages	Cash decreases	Expense reduces profit

Simplified transactions. Cash receipts are not all revenue, and timing affects the accounting.

Sources: S56, S57, S58, S59, S60, S61.

T LESSON 21 • MEETING 22 • TRY / 15 MINUTES

Read the claim, then trace the cash

Pairs: prepare a short lender briefing, then compare with another pair.

Fictional Summit Services begins with $10 cash. It earns $120 revenue, collects $80 from this year's sales, and pays all $85 of operating expenses in cash. The unpaid balance is collectible. Assume no starting receivables, taxes, depreciation, or other transactions. A new bank loan brings in $50. Management says, "Our operations generated the entire increase in cash this year." Separately, a proposed project company would borrow $20. Summit would guarantee full repayment if the project defaulted, yet management says the project debt creates no risk for Summit. All figures are dollars on the same arbitrary scale.

Record dollars. Keep the change during the year separate from the balance at year-end. Show subtraction or addition beside each result.

Measure	Calculation and result
A1 · Accounting profit	
Operating cash flow	
Financing cash flow	
Change in cash	
Ending cash balance	
Increase in receivables	

L21.A1 Calculate profit, operating cash flow, financing cash flow, the cash increase, ending cash, and the increase in receivables. Reconcile the figures.

L21.A2 Evaluate management's description of this year's cash increase. Support your explanation with the operating and financing flows.

L21.A3 If the project repays $7 of its $20 principal and defaults on the rest, what must Summit supply under the full guarantee, assuming no other recoveries? What guarantee terms should a lender request?

L21.A4 Choose one reporting control and one compensation change that could improve scrutiny. Explain a limitation of each.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 21 • MEETING 22 • REFLECT

Return to the question

Enron: earnings, cash, and trust

Worked example • A profitable repair job with no cash collection yet

Hypothetical: a business completes a $600 job on credit and pays $420 of related wages immediately. Ignore all other items.

Revenue earned: $600; expense incurred: $420.

Profit: $600 - $420 = $180.

Operating cash flow: $0 - $420 = -$420.

Receivable: $600 until the customer pays.

Profit and cash flow differ legitimately. The next questions concern collectibility and when payment will arrive.

Summit earns $35 profit while operations use $5 cash. Customers still owe $40. Borrowing supplies $50, so cash increases $45 to $55. The increase came from financing after covering the operating outflow. Under the separate full guarantee, Summit must supply the project's unpaid $13 principal. Both claims require attention to contracts and cash flows.

Enron's collapse in 2001 and the later fraud proceedings show why trustworthy reporting matters to financing relationships. The classroom exercise is a tool for asking better questions, not a method for identifying fraud from one ratio. Analysts need records, contracts, assumptions, and independent review. Strong scrutiny can coexist with acknowledging that ordinary businesses use estimates, incur losses, and sometimes make honest mistakes.

Discuss

• Why could a profitable, honestly reported business still run out of cash?

• Compare public sales research with a confidential earnings tip from an employee. What facts are missing about materiality, public availability, duties, and whether anyone traded or passed the tip to another person?

• How does an independent project differ from a project whose losses are guaranteed by its sponsor?

TAKEAWAY Evaluate performance, cash movements, and remaining obligations together. A correct total can accompany a misleading explanation, and a separate legal entity does not automatically remove the sponsor's economic exposure.

CHECK Profit without immediate cash is not automatically fictitious. Credit sales and payment timing can create legitimate differences. The relevant questions are whether recognition is justified, obligations are disclosed, and management describes the underlying transactions honestly.



R LESSON 22 • MEETING 23 • UNIT 6 • READ / BEFORE THIS LESSON

Design a system that can withstand stress

Which risks should a useful financial system accept, and how should it prepare for failure?

A town wants to finance projects that will benefit residents for years. Savers want their money much sooner. A financial institution can connect them, but it must make promises it can keep under several possible futures. Its design should provide useful financing and make risks understandable to the people who bear them.

Consider a fictional lender that finances home energy improvements. Its borrowers make monthly payments, while some of the lender's own creditors can demand money quickly. A cash buffer is money available for near-term payments. An equity buffer is the difference between assets and liabilities that can absorb losses. These buffers solve different problems. Keeping cash can avoid a hurried sale; having more equity can absorb a decline in asset values. Neither makes every promise safe under every circumstance.

A stress test asks what would happen under specified adverse conditions. It is not necessarily a prediction or an estimate of the probability of those conditions. We might ask what happens if borrower losses rise and funding leaves at the same time. The order matters: losses reduce the value of assets, withdrawals require cash, and discounted sales can produce additional losses. A test that considers only one step can miss the interaction.

Every safeguard has a cost or a limitation. For a fixed amount of funding, holding more cash leaves less to finance projects. Longer-term borrowing reduces immediate repayment exposure but may cost more. Better disclosure helps creditors evaluate promises but cannot remove a real loss. Insurance shifts specified losses to another party whose own resources and incentives matter. A guarantee can protect a creditor while putting a sponsor at risk. Ask whose position improves and who pays for the improvement.

In our final discussion, recommend a design, calculate its results, and identify a condition under which it could fail. Explain a defensible tradeoff using evidence. What would you want a financial institution to disclose before you trusted its promise to repay you?

No written response required. Bring your initial judgment to the discussion.

E

LESSON 22 • MEETING 23 • EXPLAIN

How it works

Design a system that can withstand stress

Begin with a complete balance sheet, then apply changes in order. First reduce the loan portfolio by the specified credit loss. Cash stays unchanged in this exercise. Calculate remaining equity before funding is withdrawn. Next determine the repayment required and whether cash covers it. If assets must be sold, calculate how much of their current carrying value must leave to raise the needed cash at the stated discount.

When a sale produces 80 cents per dollar of current carrying value, a $4 cash shortfall requires $4 ÷ 0.80 = $5 of assets to be sold. The additional loss is $1. Once the proceeds repay a creditor, assets and debt both fall by $4; that repayment does not create another loss. Track each change once so the same damage is not counted twice.

Compare safeguards against the same scenario and state what each changes. A larger cash allocation also reduces the amount invested in loans. Longer-term financing changes which liabilities can leave immediately. These are different mechanisms, and either can improve survival in the stated test. Their usefulness depends on how closely that test resembles the risks that matter.

The final recommendation should connect a numerical result to a value judgment. You might prioritize financing more projects, maintaining more equity after stress, or preserving access to funds for creditors. Explain the priority rather than presenting it as an arithmetic fact. Then propose a disclosure and a contingency action. A credible plan states its limits, including what happens when losses or withdrawals exceed the scenario.

Valley Energy Finance: starting designs

Balance-sheet item	Baseline	Design A	Design B
Cash	10	25	10
Project loans	90	75	90
Short-term debt	60	60	30
Long-term debt	20	20	50
Owner equity	20	20	20

Hypothetical units. Each design has assets of 100 and liabilities plus equity of 100.

Sources: S24, S62.

T LESSON 22 • MEETING 23 • TRY / 15 MINUTES

Choose a safeguard and defend it

Groups of four or five. Your teacher assigns Design A or B. Two spokespeople present, one for each design.

Use the starting balance sheets in EXPLAIN. First, loans lose 20% of value. Cash is unchanged. Next, half the short-term debt is called. Long-term debt cannot be called and no new funding arrives. Sell loans at 80% of their reduced carrying value to meet any cash gap. Separately, normal annual income is 6% of starting loans. Cash earns zero. Subtract Design B's 0.3 extra funding cost. Ignore all other income, costs and taxes. The stress is a separate scenario.

Complete Baseline and your design; enter the other design during its briefing.

Stress-test stage (same units)	Baseline	Design A	Design B
Loan loss			
Equity after loan loss			
Repayment due			
Cash shortfall before sale			
Carrying value of loans sold			
Additional sale loss			
Ending cash			
Ending loans			
Ending debt			
Ending equity			

A3 · Normal annual net income			

L22.A1 Complete each stage of the Baseline stress test in the table. Track the loan loss, repayment, cash shortfall, sale and ending balance sheet.

L22.A2 Complete the same stages for your assigned Design A or B. Record the other design's final figures during the briefings and check that assets equal debt plus equity.

L22.A3 Compare normal annual income after extra funding cost for all three designs. What does each sacrifice buy?

L22.A4 Recommend a design to the town. Use one comparison with the alternative. Name one disclosure, a contingency action, and a shock under which your design runs out of equity or misses a payment.

Finish TRY before REFLECT. Use a different pen to correct or extend one conclusion.

? LESSON 22 • MEETING 23 • REFLECT

Return to the question

Design a system that can withstand stress

Worked example • A cash shortfall is not the same as the asset sale

Hypothetical: a lender has $6 cash and must repay $10. Assets can be sold for 80% of their current carrying value.

Cash shortfall: $10 - $6 = $4.

Assets sold at carrying value: $4 ÷ 0.80 = $5.

Sale loss: $5 - $4 = $1.

After paying $10, cash is zero and debt is $10 lower.

The forced sale costs $1 of equity; repayment itself reduces assets and debt equally.

The baseline finishes with negative equity of 3 under this scenario. Design A retains 3.75 and Design B retains 0.75. Those results support a comparison but do not determine every design choice. A provides more protection here while financing fewer loans. B preserves the loan portfolio and reduces near-term repayment demands at an additional funding cost. Different shocks or prices could change their relative performance.

The course's recurring questions apply beyond banks: identify promises, trace payments, examine incentives, test assumptions, and locate the loss when conditions change. Good analysis can support several reasonable choices when people have different priorities. It cannot justify ignoring a violated balance-sheet identity or inventing certainty about the future. A useful final explanation names both what the design accomplishes and the circumstances in which it needs another response.

Discuss

• Which of your conclusions are arithmetic, and which depend on priorities or uncertain assumptions?

• Would the same safeguard protect a lender if its reports concealed a guarantee to another company?

• Who should bear losses when the stated stress is exceeded, and what behavior would that rule encourage?

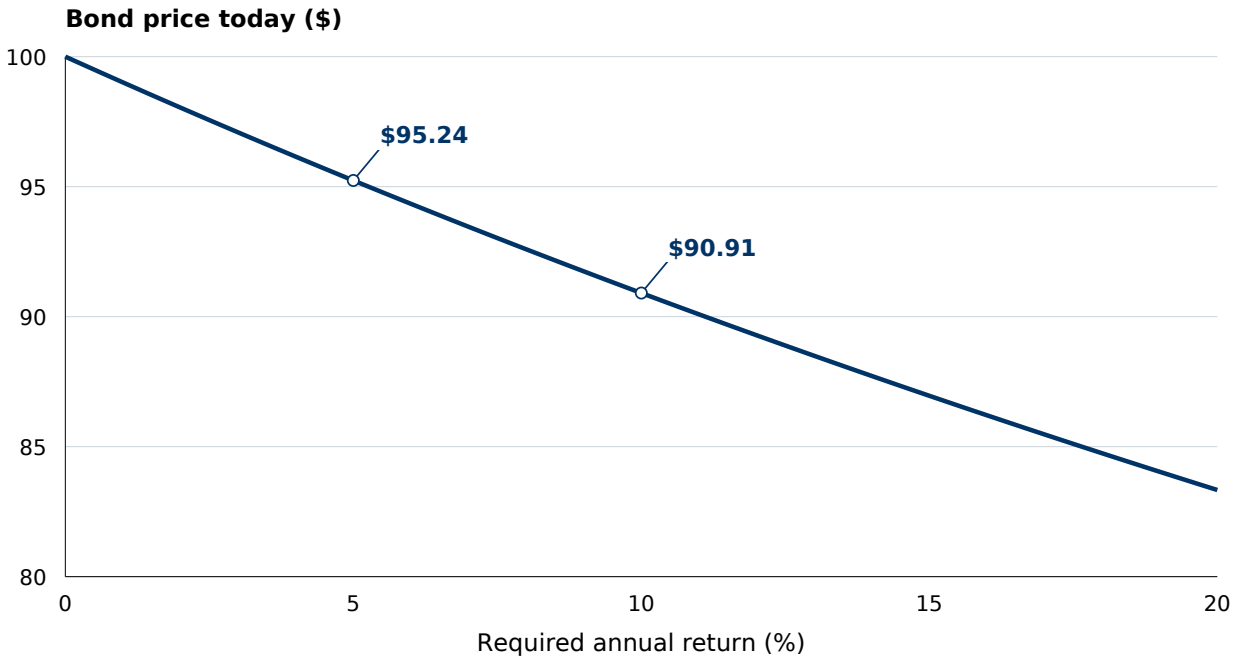
TAKEAWAY A defensible financial design combines useful financing with explicit promises, loss-absorbing resources, and a response to stress. Its strength must be judged alongside its costs, incentives, and remaining vulnerabilities.

CHECK Passing one stress test does not prove that a system is safe. The result depends on the chosen losses, withdrawal demands, timing, prices, and contractual assumptions. Change those conditions and the outcome may change materially.

VISUAL REFERENCE • LESSON 5

Reading a bond-price graph

This hypothetical zero-coupon bond pays $100 exactly one year from today, with no earlier payment. Assume no default, fees, or taxes. Let r be the buyer's required annual return as a decimal. Today's price is P = $100 / (1 + r). The horizontal axis shows the same rate as a percent.



READ THE CURVE

At 0%, the price is $100. At 5%, it is $95.24. At 10%, it is $90.91. At 20%, it is $83.33. Prices are rounded to the nearest cent. A buyer who requires a higher return offers less today for the same $100 payment in one year.

Each point compares an offer that could be made today for the same future payment. To price a coupon bond, discount the coupons as well as the principal. Credit risk, time to maturity, and contract terms also affect market prices.

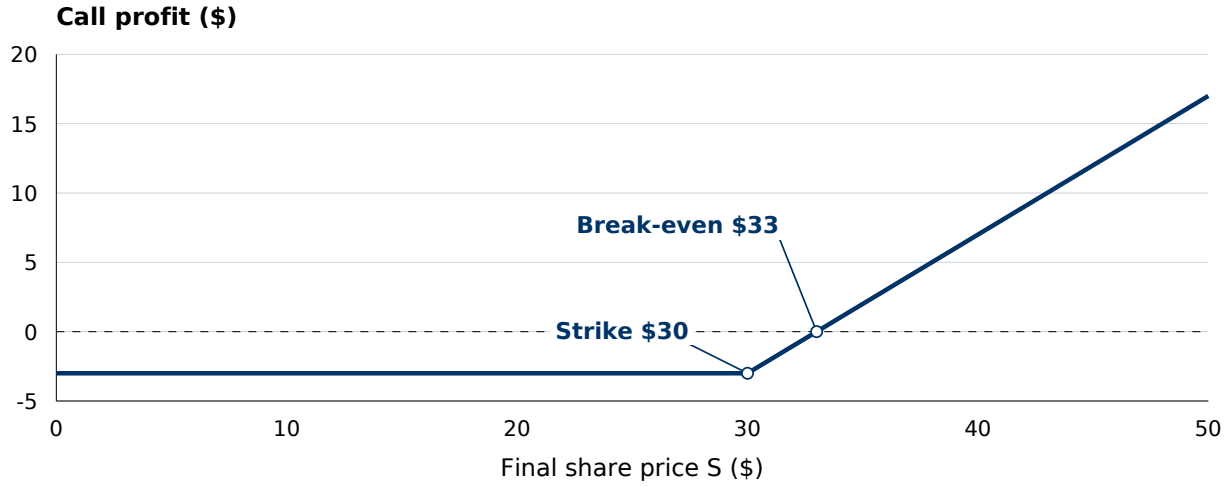
A club needs $95 today. Would selling this claim cover the bill at 5%? At 10%, how much is missing? What is the highest required yield at which the club could raise $95?

VISUAL REFERENCE • LESSON 11

From option payoff to profit

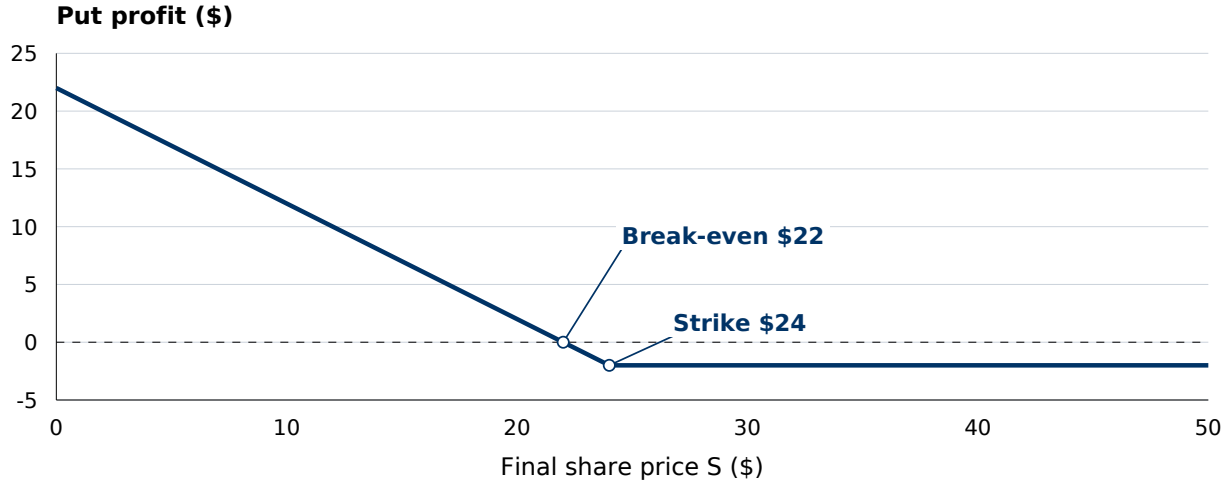
Each hypothetical option covers one share. S is the share price at expiration and K is the strike price. A buyer's profit at expiration equals the payoff minus the premium paid. Ignore fees, taxes, and interest.

Purchased call • $30 strike, $3 premium



The buyer can lose up to $3. At S = $33, profit is zero. At S = $40, payoff is $10 and profit is $7. At S = $32, why exercise even though the trade loses $1?

Purchased put • $24 strike, $2 premium



The largest loss is $2. Break-even occurs at S = $22. At S = $14, payoff is $10 and profit is $8. The dashed horizontal line marks zero profit. These graphs show the option alone, not a stock-plus-option position.

GLOSSARY

Terms worth keeping

Accrual accounting Recording revenue and expenses under recognition rules rather than only when cash is paid or received.

Acquisition A purchase that transfers ownership or control of a business or its assets.

Administered rate An interest rate set by the central bank for a specified balance or facility.

Asset A resource owned or a claim to a future benefit or payment.

Bank run A concentrated rush to withdraw deposits driven by concern about losses or access to funds.

Bond A debt security giving its holder a claim on specified payments from an issuer.

Call option A contract giving its buyer a right to buy an asset at a specified strike price under stated terms.

Carry Income from holding a position minus its financing and holding costs, before price changes.

Cash buffer Immediately available funds held to meet payments without a forced sale.

Collateral Property pledged to support repayment of an obligation.

Conflict of interest A situation in which a person's other incentives may interfere with a duty or judgment.

Contingency plan A specified course of action if funding, asset values, or other conditions deteriorate.

Convergence trade A position intended to profit when a specified price difference narrows.

Correlation A measure of how two quantities vary together over specified observations.

Counterparty A person or institution on the other side of a financial contract.

Debt service The interest and principal payments due on debt during a stated period.

Dilution A decline in an existing owner’s percentage ownership, often caused by issuing additional shares.

Diversification Combining different exposures to reduce some sources of overall risk.

Equity An ownership claim on a business; common equity receives what remains after higher-priority claims.

GLOSSARY

Glossary, continued

Equity capital The residual value of assets after liabilities; the simplified loss-absorbing cushion in this course.

Exit value The value received when an investment is sold; distinguish the operating business’s sale price from equity proceeds after debt repayment.

Expected value A probability-weighted average of possible outcomes.

Federal funds rate The rate on unsecured overnight borrowing in the federal funds market. The effective rate summarizes actual trades.

Financial claim A stated right to receive payment or another benefit from another party.

Fire sale An urgent asset sale at a depressed price under stressed conditions.

First-loss layer The claim or funding cushion that absorbs specified losses before protected claims.

Haircut The fraction of collateral value not financed by the lender in the simplified repo calculation.

Inflation An increase in the general price level over a stated period.

Insurance premium The payment for insurance coverage under a policy.

Interest rate The price of borrowing for a specified period, expressed as a percentage of the amount borrowed. It is not necessarily the investor’s holding-period return.

Interest-rate swap An agreement to exchange interest payments calculated under specified fixed or floating rates and a stated notional amount.

Leverage Using borrowing or other arrangements to increase exposure relative to one's own funds.

Leveraged buyout An acquisition financed substantially with debt whose repayment depends on the acquired business or transaction structure.

Liability An obligation owed to another party.

Liquidity Ability to meet payments when due, using available funds or reliable access to funds.

Maintenance margin The minimum equity support required to continue holding a financed position under the relevant terms.

GLOSSARY

Glossary, continued

Maturity mismatch Funding longer-term assets with obligations that must or may be repaid sooner.

Medium of exchange Something accepted in payment for goods and services.

Moral hazard A change in risk-taking incentives caused by protection from some consequences.

Net worth The value of a person's or firm's assets less its liabilities. See Lesson 1, READ p. 6 and EXPLAIN p. 7.

Nominal return A nominal holding-period return measures the gain or loss in dollars as a percentage of the starting investment, before adjusting for inflation. With no contributions or withdrawals, count any income paid out as well as the change in market value. A $100 investment worth $100 at year-end that also paid $4 has a 4% nominal return.

Option premium The price the buyer pays for an option.

Payment instrument A means of initiating a payment, such as a debit card. See Lesson 1, READ p. 6 and EXPLAIN p. 7.

Post-money valuation The company's implied equity value immediately after a new equity investment, given the negotiated price and rights.

Prepayment Repayment of loan principal earlier than its scheduled date.

Present value Today's equivalent of a future payment, calculated using a stated discount rate.

Project finance Financing organized primarily around a particular project's cash flows, assets, and contractual arrangements.

Put option A contract giving its buyer a right to sell an asset at a specified strike price under stated terms.

Real return The percentage change in purchasing power after adjusting for inflation.

Recapitalization A change in owner funding or capital structure intended to support or reorganize a business.

Receivable An amount a customer or other party owes a business.

GLOSSARY

Glossary, continued

Repo A sale and agreed repurchase of securities that economically provides collateralized short-term financing.

Required yield The annual return a buyer requires for the timing and risk of the promised payments. It helps determine the price the buyer will pay. The actual return depends on payments received and any resale price.

Reserve balances Deposits that eligible institutions hold at a Federal Reserve Bank, used for settlement and other purposes. A balance is an asset of the institution holding it and a liability of its Federal Reserve Bank. A project reserve instead means cash set aside for project obligations.

Risk aversion A preference for a certain amount over a gamble with the same expected monetary value.

Rollover risk The risk that maturing borrowing cannot be replaced on workable terms.

Securitization Pooling financial assets and issuing securities supported by their cash flows.

Servicer The party that collects payments and administers loans under an agreement.

Short sale Sale of a borrowed security that must later be replaced and returned.

Solvency Having sufficient asset value to cover liabilities; distinct from having immediate payment funds.

Spillover A consequence of a decision or event for people beyond the original transaction.

Store of value Something that carries purchasing power from now to later. How much it will buy later can change. See Lesson 1, READ p. 6 and EXPLAIN p. 7.

Stress test An analysis of consequences under specified adverse conditions, not necessarily a prediction.

Tranche A class of claims with specified priority or cash-flow rules within a financing structure.

Unit of account A common unit used to quote and compare prices.

Waterfall The contract specifies the order in which cash is distributed and which claims absorb losses first. In our example, senior receives principal first and junior absorbs principal losses first.

FLEXIBLE DAYS

Guest speaker notes

Speaker, role and date. Who relies on this person’s work?

What decision does this person make? What information do they need?

Who bears risk in their work? What would change under stress?

FLEXIBLE DAYS

Questions and connections

A claim I want to understand better

A connection to one of our classroom examples

A useful question to ask next

REFERENCE NOTES

Sources and further reading

Use the source numbers on the explanation pages to find the corresponding titles and publishers here. In the digital edition, select a title to open the source. The notes identify the claims each source supports and any limits on its use.

S01 Money in the modern economy: an introduction

Bank of England

Supports the distinction among currency, bank deposits, and reserves. Original classroom examples are hypothetical.

S02 Money and Inflation: A Functional Relationship

Federal Reserve Bank of St. Louis

Supports the three functions of money and exchange coordination. The fair, ticket arithmetic, and policy choices are original hypothetical material.

S03 Money creation in the modern economy

Bank of England

Supports loan-created deposits and limits on lending. The classroom ledgers are original simplified examples, not UK regulatory rules.

S04 What is the difference between a bank’s liquidity and its capital?

Federal Reserve Board

Supports the conceptual distinction between liquidity and loss-absorbing capital. Equity is the simplified capital measure used here; regulatory capital has additional definitions.

S05 Deposit Insurance at a Glance

Federal Deposit Insurance Corporation

Section “How much of my money is insured?” Standard coverage is $250,000 per depositor, per insured bank, per ownership category; same-category deposits at one bank are aggregated across deposit types. Verified 2026-11-12.

S06 Review of the Federal Reserve’s Supervision and Regulation of Silicon Valley Bank: Key Takeaways

Board of Governors of the Federal Reserve System, April 2023

Point 1, final two paragraphs: March 8 announcement; more than $40 billion withdrawn March 9; closure March 10. The classroom decision is set on the morning of March 9; its payroll manager is fictional. Verified 2026-11-12.

S07 Joint Statement by Treasury, Federal Reserve, and FDIC, March 12, 2023

U.S. Department of the Treasury; Federal Reserve Board; FDIC

SVB depositors would have access to all funds on March 13 under the announced systemic-risk action. Shareholders and certain unsecured debtholders were not protected. This exceptional action is distinct from ordinary coverage limits. Verified 2026-11-12.

REFERENCE NOTES

Sources, continued

S08 Fixed Income Investments: When Interest Rates Go Up, Prices of Fixed-Rate Bonds Fall

U.S. Securities and Exchange Commission, Investor.gov

Supports the inverse fixed-payment price/yield relationship and distinction between promised payments and market price. Classroom numbers and comparisons are original.

S09 Thrifts and Housing Finance: Implications of a Stricter Qualified Thrift Lender Test, GAO/GGD-91-24

U.S. General Accounting Office

April 1991, chapter 2, printed p. 24 (PDF p. 26): 1982 industry borrowing costs averaged just over 11%, mortgage earnings just under 11%. These annual historical averages differ from the invented 20% yield shock. Verified 2026-11-12.

S10 Savings and Loan Crisis

Federal Reserve History; Kenneth J. Robinson

Supports the brief historical fixed-rate mortgage/funding mismatch connection. Other causes included regulatory responses and subsequent risk-taking; no historical cost totals are used.

S11 Income and the Consumer Price Index (CPI)

U.S. Bureau of Labor Statistics

Definitions of nominal and real income and price-index adjustment. Accessed 2026-11-05; lesson figures are hypothetical.

S12 Constructing ex ante real interest rates on FRED

Federal Reserve Bank of St. Louis

Exact gross-return relationship and distinction between expected and realized inflation. No current rates used.

S13 Interest on Reserve Balances Frequently Asked Questions

Board of Governors of the Federal Reserve System

Questions “What is the IORB rate?” and “Prior to the implementation of the IORB rate…”: the Board sets IORB; the single rate began July 29, 2021, replacing IORR and IOER. “What are reserves, why are they important, and how do they work?” identifies the institution’s asset and Federal Reserve Bank’s liability. No current rate is asserted. Verified 2026-11-12.

S14 Monetary Policy Implementation

Federal Reserve Bank of New York

Target range, administered rates, and roles of supporting facilities. Accessed 2026-11-05. Classroom market is deliberately simplified.

REFERENCE NOTES

Sources, continued

S15 What Happened in Money Markets in September 2019?

Sriya Anbil, Alyssa Anderson and Zeynep Senyuz; Federal Reserve Board, FEDS Notes, February 27, 2020

Sriya Anbil, Alyssa Anderson, and Zeynep Senyuz, FEDS Notes, February 27, 2020. Sections “What happened?” and “How did the Fed Respond?” report rates and the $53 billion repo. Explanations of contributing pressures are the authors’ analysis. Verified 2026-11-12.

S16 Additional Information about Reference Rates Administered by the New York Fed

Federal Reserve Bank of New York

Section “Calculation Methodology for the EFFR and OBFR”: the effective rate is a median of reported rates, weighted by transaction dollar volume; it is not the rate on every individual trade. Verified 2026-11-12.

S17 How Does Insurance Work?

National Association of Insurance Commissioners

Policy, premium, deductible, and covered-loss terminology. Classroom policies are hypothetical simplified contracts.

S18 Company history: the Philadelphia Contributionship

The Philadelphia Contributionship

The insurer’s “Company History” section documents the 1752 founding, building surveys and directors’ rate setting. Early policies used refundable deposits, not the modern annual workshop premium in the fictional lesson. Verified 2026-11-12.

S19 Asset Allocation and Diversification

U.S. Securities and Exchange Commission, Investor.gov

Diversification, portfolio choices, and differing risk tolerance. Hypothetical scenario returns are original.

S20 Beginners' Guide to Asset Allocation, Diversification, and Rebalancing

U.S. Securities and Exchange Commission, Investor.gov

Background on spreading exposure across and within investments; no personalized recommendation.

S21 Non-Bank Financial Institutions and Banks' Fire-Sale Vulnerabilities

Federal Reserve Bank of New York

Primary research background for shared holdings and indirect exposure through fire sales. No numerical estimates from the paper are used.

S22 Investor Bulletin: Understanding Margin Accounts

U.S. Securities and Exchange Commission, Investor.gov

Borrowing, maintenance demands, liquidation rights, and magnified losses. Accessed 2026-11-05; activity threshold is fictional rather than a current rule.

REFERENCE NOTES

Sources, continued

S23 Archegos: FINMA concludes proceedings against Credit Suisse

Swiss Financial Market Supervisory Authority (FINMA), July 24, 2023

July 24, 2023, sections on hedge-fund risks, forced sales and organisational deficiencies. FINMA found deficiencies involving synthetic exposure, collateral and repeated limit breaches. The lesson’s loan and later price recovery are fictional. Verified 2026-11-12.

S24 Types of Financial System Vulnerabilities and Risks

Board of Governors of the Federal Reserve System

Mechanisms connecting borrowing, funding pressure, forced selling, and financial-system stress. No claim about current vulnerability levels.

S25 An Introduction to Options - Investor Bulletin

U.S. Securities and Exchange Commission, Investor.gov

Verified option rights, premium, strike and common 100-share contract size. Accessed 2026-11-05. Classroom figures are original; expiration-only treatment is an explicit simplification.

S26 Options Basics

The Options Industry Council, an industry education resource of OCC

Verified holder/writer obligations and protective-put use. Read as a primary industry education source, not as a recommendation to trade. Classroom examples are original.

S27 Roadmap to Funding a Small Business

SEC Office of the Advocate for Small Business Capital Formation

Verified distinctions among loans, ownership funding, dilution, and early-stage investor categories. Classroom share counts and payout scenarios are original.

S28 Private Funds

U.S. Securities and Exchange Commission

Verified venture funds pool investor money and commonly take equity in businesses. No securities-offering exemption or eligibility advice is taught. Accessed 2026-11-05.

S29 Investment capital

U.S. Small Business Administration

Verified basic debt and equity definitions. Current advertised loan rates and eligibility rules are not used.

S30 Project Finance - Key Concepts

World Bank Public-Private Partnership Resource Center

Verified project-company structure, construction-period funding needs, and limited/non-recourse distinctions. No claim is made that off-balance-sheet presentation removes economic obligations.

S31 Swaps Report Data Dictionary

Commodity Futures Trading Commission

Verified fixed-floating swaps, notional amounts, and exchange of interest cash flows. The classroom benchmark r is hypothetical; the source’s legacy LIBOR numerical example is not reproduced.

REFERENCE NOTES

Sources, continued

S32 Leverage: Nobel lecture

Merton H. Miller, Nobel Prize Outreach, December 7, 1990

Nobel lecture, December 7, 1990, printed pp. 291-292. Explains financing replication and tax qualifications. The classroom sidebar uses identical operating cash flows, equal replication terms and the no-tax model.

S33 Interest Rate Swaps: Consider All the Options in Managing Interest Rate Risk

Federal Home Loan Bank of New York

Verified the pay-fixed/receive-floating hedge direction and need to consider collateral and contract terms. No product recommendation or current pricing is used.

S34 Leveraged Finance

Office of the Comptroller of the Currency

Verified the basic acquisition-financing definition and that acquisition debt can sit on the acquired entity's books. No current regulatory leverage threshold is used.

S35 Private Equity Funds

U.S. Securities and Exchange Commission, Investor.gov

Verified pooled investment, controlling interests, management involvement, and potential conflicts. Hypothetical factory scenarios do not claim representative industry outcomes.

S36 Metropolitan Life Insurance Co. v. RJR Nabisco, Inc., 906 F.2d 884

U.S. Court of Appeals for the Second Circuit, 906 F.2d 884 (1990)

Second Circuit opinion, June 25, 1990, reproduced by Justia; factual background. Records October 1988 proposal, November 17 suit and December 1 KKR acceptance. The suit does not itself establish default or wrongdoing. Verified 2026-11-12.

S37 Staff Report: Enhancing Disclosure in the Mortgage-Backed Securities Markets

U.S. Securities and Exchange Commission

2003 staff report, sections II.C-D. Documents the first Ginnie Mae guarantee in 1970, pool ownership, guarantees, pass-throughs, and prepayment risk.

S38 Report to the Congress on Risk Retention, October 2010

Board of Governors of the Federal Reserve System

"Overview of Securitization: Structure of Securities," figure 1 discussion, explains payment priority and first-loss order. "Mechanisms to Align Incentives and Mitigate Risk: Commercial Mortgage-Backed Securities," opening paragraphs, describes specialist B-piece buyers reviewing individual loans. Historical market practices, not current requirements. Verified 2026-11-12.

S39 Financial Accounting Manual for Federal Reserve Banks, January 2026, chapter 4

Board of Governors of the Federal Reserve System, January 2026

Section 40.13, "Federal Agency and GSE MBS": principal paid and investor amortized cost basis can differ. This is Federal Reserve accounting, used to clarify the distinction rather than prescribe private-investor accounting. Verified 2026-11-12.

REFERENCE NOTES

Sources, continued

S40 Repo Runs: Evidence from the Tri-Party Repo Market, Staff Report 506

Adam Copeland, Antoine Martin and Michael Walker, Federal Reserve Bank of New York Staff Report 506

Adam Copeland, Antoine Martin, and Michael Walker, July 2011; revised August 2014, abstract. Tri-party margins and funding were stable for most borrowers, while Lehman's funding fell sharply. Findings are specific to market segments, not every repo lender. Verified 2026-11-12.

S41 More Lessons from the Crisis

Federal Reserve Bank of New York

William Dudley, November 13, 2009; official retrospective on dealer funding fragility. Provides a policymaker perspective, not a complete causal account.

S42 Bear Stearns, JPMorgan Chase, and Maiden Lane LLC

Board of Governors of the Federal Reserve System

Federal Reserve Board overview, Background and Bridge Loan sections. Documents the March 13 warning, Friday bridge loan, Sunday acquisition agreement, and Monday bridge repayment.

S43 Support for Specific Institutions

Federal Reserve History

Supports September 15, 2008 Lehman bankruptcy and September 16 AIG assistance; historical overview.

S44 Treasury Announces TARP Capital Purchase Program Description

U.S. Department of the Treasury

October 14, 2008, HP-1207, opening terms: Treasury announced purchases of senior preferred shares. This capital instrument differs from the September 16 AIG secured credit facility. Verified 2026-11-12.

S45 Federal Reserve Board authorizes lending to American International Group

Board of Governors of the Federal Reserve System

September 16, 2008, 9:00 p.m. EDT announcement: secured facility up to $85 billion and announced 79.9% government equity interest. A facility ceiling is not cash already drawn or an eventual loss. Verified 2026-11-12.

S46 Report to Congress: Secured Credit Facility Authorized for AIG on September 16, 2008

Board of Governors of the Federal Reserve System

"Board's Authorization," pp. 2-3, especially p. 3: collateral calls and liquidity pressure preceded September 16. The report's overview gives the facility ceiling. Verified 2026-11-12.

S47 Lehman Brothers Holdings Inc., Form 8-K, September 15, 2008

Lehman Brothers Holdings Inc., filed with the U.S. Securities and Exchange Commission, September 15, 2008

Item 1.03 records the parent company's September 15 Chapter 11 filing. It separately identifies LB 745 LLC's September 16 filing. Verified 2026-11-12.

REFERENCE NOTES

Sources, continued

S48 Mary L. Schapiro, Testimony Concerning the Lehman Brothers Examiner's Report

Mary L. Schapiro, U.S. Securities and Exchange Commission, April 20, 2010

April 20, 2010, "The immediate causes of failure," paragraph beginning "According to the Examiner's Report": collateral and authority explanations are attributed accounts of the government's reasoning. Schapiro testified on her own behalf. Verified 2026-11-12.

S49 The Financial Crisis Inquiry Report, January 2011

Financial Crisis Inquiry Commission, January 2011

Chapter 18 conclusion, printed p. 343 (PDF p. 372): the majority's interpretation includes political reaction, moral hazard and misjudged systemic effects. Its counterfactual assessment is not an observed alternative outcome. Verified 2026-11-12.

S50 Investor Bulletin: An Introduction to Short Sales

SEC Investor.gov

Basic borrowing, replacement, and short-position risks; consulted 2026-11-05. No current margin percentage is asserted.

S51 Margin: Borrowing Money to Pay for Stocks

U.S. Securities and Exchange Commission

Interim collateral and forced-liquidation concepts only; activity terms are fictional. Consulted 2026-11-05.

S52 Statement of William J. McDonough, October 1, 1998

Federal Reserve Bank of New York

Paragraphs beginning "These unusual conditions" and "On September 2" describe widening spreads and the letter reporting a 52% loss through August. This is McDonough's description of the letter, not the original letter. Later paragraphs describe officials' feared spillovers. Verified 2026-11-12.

S53 Private-sector refinancing of LTCM, October 1, 1998

Board of Governors of the Federal Reserve System

Primary testimony on absence of Federal Reserve funding, contagion concerns, and incentive questions.

S54 Near Failure of Long-Term Capital Management

Federal Reserve History

Retrospective overview. For separate dates of the consortium agreement and funding, use GAO/GGD-00-67R p. 1 note 2: September 23 and September 28, 1998, respectively.

S55 Responses to Questions Concerning LTCM and Related Events, GAO/GGD-00-67R

U.S. General Accounting Office

February 23, 2000, pp. 1-2, especially p. 1 note 2: 14 firms agreed September 23 and contributed about $3.6 billion September 28. No federal money was committed; the background links Russia's August moratorium with flight to quality and liquidity. Verified 2026-11-12.

REFERENCE NOTES

Sources, continued

S56 Beginners' Guide to Financial Statements

U.S. Securities and Exchange Commission

General distinctions among income, operating cash, and financing cash; original examples are simplified.

S57 SEC v. Ben F. Glisan, Jr., Case H-03-3628, Litigation Release 18335

U.S. Securities and Exchange Commission

September 10, 2003, also AAER 1852. The body concerns Glisan despite a migrated “Citigroup, Inc.” page heading. It describes allegations and a simultaneous civil settlement without admitting or denying them. Verified 2026-11-12.

S58 SEC Settles Enforcement Proceedings Against J.P. Morgan Chase and Citigroup, Release 2003-87

U.S. Securities and Exchange Commission

July 28, 2003, “Specifically as to J.P. Morgan Chase,” Mahonia contract chain: linked transactions exchanged cash now for repayment plus interest independent of commodity prices. Distinguish SEC allegations and agreed settlements from criminal convictions. Verified 2026-11-12.

S59 SEC Charges Jeffrey K. Skilling, February 19, 2004

U.S. Securities and Exchange Commission

Primary complaint announcement supports description of alleged deceptive reporting; not treated as a conviction.

S60 United States v. Jeffrey K. Skilling

U.S. Department of Justice

Confirms May 25, 2006 conviction and legal outcome. Bankruptcy timing cross-checked with DOJ/FBI June 21, 2013 release.

S61 Insider Trading

U.S. Securities and Exchange Commission / Investor.gov

Opening definition: material nonpublic information, breach of a duty or relationship of trust, and trading or tipping are relevant. Ask which facts are missing before drawing a legal conclusion about the fictional tip. Verified 2026-11-12.

S62 Liquidity risk management and supervision

Basel Committee on Banking Supervision, Bank for International Settlements

Principles on liquidity cushions, stress scenarios, and contingency planning; consulted 2026-11-05. No jurisdiction-specific requirement is asserted.

Optional books

Michael Lewis, Liar’s Poker. Roger Lowenstein, When Genius Failed. Bryan Burrough and John Helyar, Barbarians at the Gate. Bethany McLean and Peter Elkind, The Smartest Guys in the Room. James B. Stewart, Den of Thieves.