CHARTA LEARNING · LESSON NOTES

Repurchase Agreements and Financing

FRM Part II

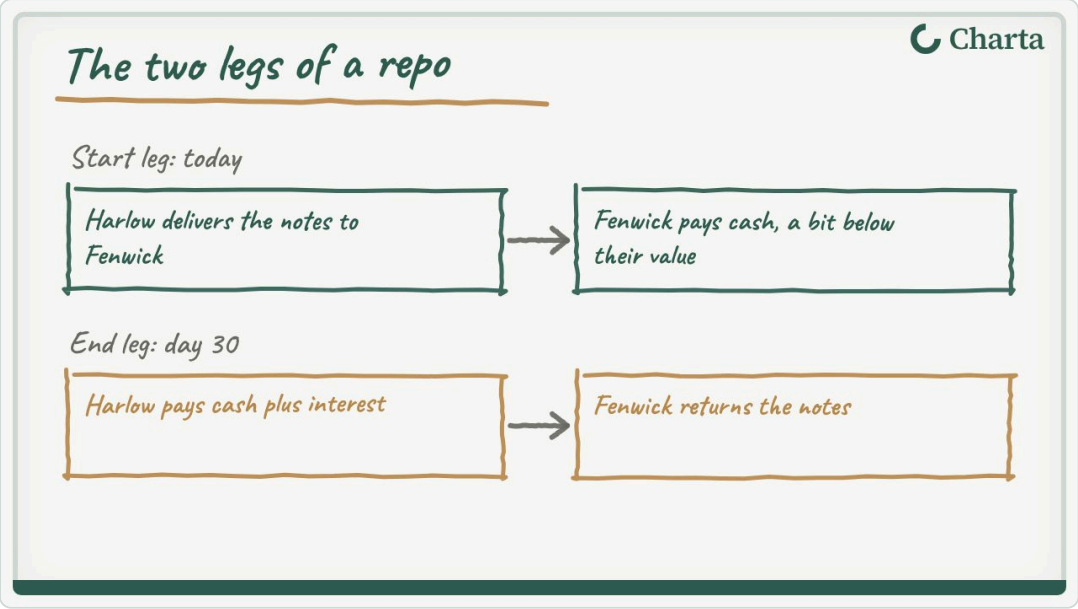
1 A story: cash tonight, bonds back later

- Harlow Securities owns $100m of Treasury notes
- It needs cash today but wants to keep the notes
- Fenwick Cash Fund has spare cash to invest safely
- Answer: a repo. Sell now, buy back in 30 days

IN THE LESSON

- Harlow Securities is a dealer.
- It owns one hundred million dollars of U S Treasury notes, which it holds as inventory to sell to clients.
- Today it needs cash to pay for other purchases, but it does not want to sell the notes, because it expects to sell them to clients next month.
- Across town, the Fenwick Cash Fund, a money market fund, has spare cash and wants a safe short-term return.
- The neat answer is a repo.
- Harlow sells the notes to Fenwick today and promises to buy them back in thirty days at a set price.
- Harlow gets cash, and Fenwick holds the notes in case Harlow fails to come back.

2 The two legs of a repo



IN THE LESSON

- A repo has two legs, and the boxes show them.
- Look at the top row, the start leg, today.
- Harlow delivers the Treasury notes to Fenwick.
- Fenwick pays Harlow the cash, which is a little less than the notes are worth.
- Now the bottom row, the end leg, in thirty days.
- Harlow pays back the cash plus the agreed interest, which together make the repurchase price.
- Fenwick then returns the notes to Harlow.
- Because the buy back is binding, at a set date and a set price, the deal works economically like a loan of cash secured on the notes, that is, a collateralised loan.
- Harlow is the cash borrower and Fenwick is the cash lender.

3 Repo or reverse repo: the same trade

- Seller of securities = cash borrower: a repo
- Buyer of securities = cash lender: a reverse repo
- One trade, two names, depending on the side
- Repurchase price = cash lent + interest
- US dollar: 360-day year; some markets use 365

IN THE LESSON

- Now the labels, which the exam likes to test.
- The seller of the securities is the cash borrower.
- For Harlow, the trade is a repo.
- The buyer of the securities is the cash lender, and the very same trade, seen from Fenwick's side, is called a reverse repo.
- There is only one trade, so one party's repo is always the other party's reverse repo.
- The repurchase price is the cash lent plus the interest, which is set by the repo rate.
- The day count matters too.
- U S dollar repos count three hundred and sixty days in a year, while some other markets count three hundred and sixty five.

4 The settlement amounts

Cash = Value × (1 − Haircut)
Interest = Cash × Rate × Days ÷ 360
Repurchase price = Cash + Interest

Value	Market value of collateral
Haircut	Cut that protects the lender
Cash	What the lender pays out
Rate	The repo rate, a year

IN THE LESSON

- Here are the formulas.
- Write Value for the market value of the collateral.
- The lender does not hand over the full value.
- It hands over the value less a haircut, a percentage cut that protects it.
- So Cash equals Value times one minus the Haircut.
- Because the cash is less than the collateral, the lender is over-collateralised.
- Interest is then charged on the cash, not on the value.
- Interest equals Cash times the repo Rate, times Days divided by three hundred and sixty, where Days is the number of days until the repurchase.
- Finally, the repurchase price, the amount the borrower pays on the end leg, equals Cash plus Interest.

5 Example 1: Harlow's settlement amounts

Notes worth $100m. Haircut 2%, repo rate 4.5%, term 30 days, 360-day year

Cash lent	100m × (1 − 2%)	**$98,000,000**
Lender's cover	100 ÷ 98	**102.0%**
Interest	98m × 4.5% × 30 ÷ 360	**$367,500**
Repurchase price	98m + 367,500	**$98,367,500**

IN THE LESSON

- Let us price Harlow's repo.
- The notes are worth one hundred million dollars, the haircut is two per cent, the repo rate is four point five per cent, and the term is thirty days.
- First the cash Fenwick pays: one hundred million times ninety eight per cent, which is ninety eight million dollars.
- Fenwick's cover is one hundred over ninety eight, about one hundred and two per cent of the cash lent.
- Interest is ninety eight million times four point five per cent times thirty over three hundred and sixty, which is three hundred and sixty seven thousand five hundred dollars.
- The repurchase price is ninety eight million plus that interest: ninety eight million, three hundred and sixty seven thousand, five hundred dollars.
- That is what Harlow pays on day thirty.

6 Example 2: three slips to avoid

Same deal: cash $98m, value $100m, 4.5%, 30 days. Right interest: $367,500

Slip 1: interest on value	100m × 4.5% × 30 ÷ 360	**$375,000**
Slip 2: 365-day count	98m × 4.5% × 30 ÷ 365	**$362,466**
Slip 3: labels swapped	Harlow called the reverse repo	**Harlow: repo**
Right answer	98m × 4.5% × 30 ÷ 360	**$367,500**

IN THE LESSON

- Now the three classic slips, using the same deal.
- Slip one is charging interest on the market value instead of the cash lent.
- One hundred million times four point five per cent times thirty over three hundred and sixty gives three hundred and seventy five thousand dollars, which is seven thousand five hundred too much.
- Slip two is the wrong day count.
- Dividing by three hundred and sixty five gives about three hundred and sixty two thousand, four hundred and sixty six dollars, but a U S dollar repo uses three hundred and sixty.
- Slip three is mixing up the labels, for example calling Harlow's side a reverse repo.
- Harlow, the borrower of cash, does a repo.
- Fenwick, the lender of cash, does a reverse repo.
- The right answer remains three hundred and sixty seven thousand five hundred dollars.

7 Why both sides want the trade

- Cash-rich: money funds, corporate treasurers
- Reverse repo for cash management: return plus collateral
- Safer than an unsecured deposit
- Cash-needy: repo for liquidity management
- Raise cash, keep the securities, avoid a fire sale

IN THE LESSON

- Why do firms enter repos?
- Because the trade serves both sides of the market.
- On one side are cash-rich parties, such as money market funds and corporate treasurers.
- They use a reverse repo for cash management.
- They earn a short-term return while holding high quality collateral, which is safer than an unsecured deposit with a bank.
- On the other side are cash-needy parties.
- They use a repo for liquidity management.
- They raise cash against securities they own without selling them outright, so they keep the price exposure and avoid a fire sale, meaning a forced sale at a poor price.
- Dealers fund their inventory this way, and leveraged investors finance their positions.

8 Example 3: Fenwick's cash management

Fenwick's reverse repo: lend $98m for 30 days against $100m of notes

Cash put to work	for 30 days	**$98,000,000**
Collateral held	2m more than the cash	**$100,000,000**
Interest earned	at 4.5%	**$367,500**
Received on day 30	98m + 367,500	**$98,367,500**

Unsecured deposit: if the bank fails, Fenwick is an unsecured creditor

IN THE LESSON

- Look at the trade from Fenwick's side.
- Fenwick's reverse repo puts ninety eight million dollars of spare cash to work for thirty days.
- In return it holds Treasury notes worth one hundred million, so the collateral is two million more than the cash it is owed.
- Over the thirty days it earns three hundred and sixty seven thousand five hundred dollars of interest, at four point five per cent.
- On day thirty it receives the repurchase price, ninety eight million, three hundred and sixty seven thousand, five hundred dollars.
- Compare an unsecured deposit with a bank.
- If that bank failed, Fenwick would be one more unsecured creditor.
- In the repo, Fenwick already holds notes that it can sell.

9 Example 4: Harlow funds its inventory

$500m inventory, one year. Repo 4.5%, haircut 2%; unsecured funding 6.5%

Repo cash: cost	490m × 4.5%	**$22.05m**
Haircut funded unsecured	10m × 6.5%	**$0.65m**
Total with repo	22.05 + 0.65	**$22.70m**
All unsecured instead	500m × 6.5%	**$32.50m**
Saving from repo	32.50 − 22.70	**$9.80m**

IN THE LESSON

- Now Harlow's side, liquidity management.
- Harlow holds five hundred million dollars of Treasury inventory and must fund it for a year, rolling its repos and assuming rates stay put.
- With a two per cent haircut, repo raises four hundred and ninety million.
- At four point five per cent that costs twenty two point zero five million a year.
- But the haircut, ten million, must be financed elsewhere, say with unsecured borrowing at six point five per cent, which costs zero point six five million.
- The total is twenty two point seven million.
- Funding everything unsecured would cost five hundred million times six point five per cent, thirty two point five million.
- Repo saves nine point eight million because it is collateralised, and Harlow keeps the notes.

10 Example 5: a leveraged investor's haircut

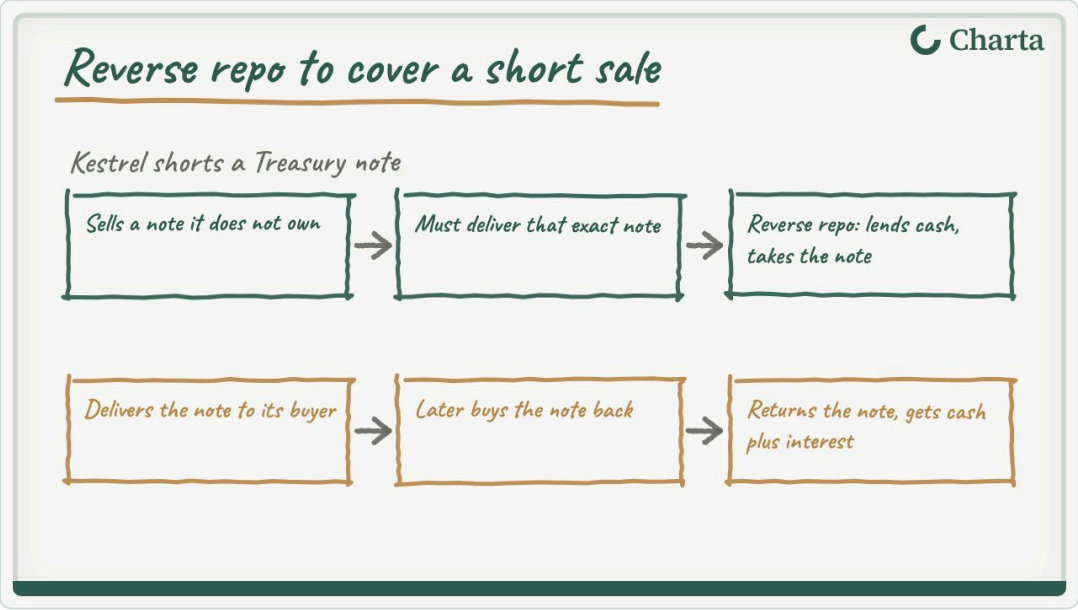
Kestrel Capital buys a $50m bond and finances it by repo with a 5% haircut

Cash raised by repo	50m × (1 − 5%)	**$47.5m**
Equity Kestrel supplies	50m × 5%	**$2.5m**
Leverage	50 ÷ 2.5 = 1 ÷ 5%	**20 times**
Loss if the bond falls 1%	50m × 1%	**$0.5m**
Share of equity lost	0.5 ÷ 2.5	**20%**

IN THE LESSON

- A leveraged investor, the made up hedge fund Kestrel Capital, wants to own a fifty million dollar bond.
- Its repo lender takes a five per cent haircut, so the repo raises forty seven point five million dollars.
- Kestrel must supply the rest, two point five million, from its own money.
- That is the key idea: for a leveraged investor, the haircut is the equity it must put up.
- Kestrel controls fifty million of bonds with two point five million of equity, a leverage of twenty times, which is one divided by the haircut.
- If the bond falls just one per cent, Kestrel loses half a million dollars, which is twenty per cent of its equity.
- A smaller haircut means more leverage.

11 Reverse repo to cover a short sale



IN THE LESSON

- Repos have one more standard use: borrowing a particular security.
- Suppose Kestrel expects a certain Treasury note to fall in price, so it sells the note short, meaning it sells a note it does not own.
- Follow the boxes.
- First, Kestrel sells the note it does not have.
- Second, it must deliver that exact note to the buyer.
- Third, it enters a reverse repo: it lends cash and takes in that specific note as collateral.
- On the bottom row, it delivers the note to its buyer.
- Later it buys the note back in the market, hopefully cheaper.
- Then, at the repo's end, it returns the note and receives its cash plus interest.
- The reverse repo is the standard route to borrow a security for a short sale.

12 Two linked risks

- Counterparty risk: a party defaults while exposed
- Lender: collateral may fetch less than cash plus interest
- Lender's protection: haircut and daily variation margin
- Borrower: posted more than it got; excess at risk
- Second risk: liquidity risk, next

IN THE LESSON

- Repos are collateralised, but they are not free of risk.
- They create two linked risks.
- The first is counterparty risk, the chance that one party defaults while the other holds an exposure to it.
- The cash lender is exposed if the borrower defaults and the collateral, once sold, brings in less than the cash plus accrued interest it is owed.
- Its protection is the haircut and daily variation margin, meaning extra collateral called each day when the collateral's price falls.
- The borrower is exposed too.
- It posted collateral worth more than the cash it received, and it may not get that excess back if the lender fails.
- The second risk, liquidity risk, we take next.

13 Example 6: if Harlow defaults

Harlow defaults on day 10. The notes have fallen 3% from $100m

Accrued interest	98m × 4.5% × 10 ÷ 360	**$122,500**
Owed to Fenwick	98m + 122,500	**$98,122,500**
Notes sold for	100m × (1 − 3%)	**$97,000,000**
Fenwick's shortfall	98,122,500 − 97m	**$1,122,500**
Fall the haircut covered	1 − 98.1225 ÷ 100	**1.88%**

IN THE LESSON

- Suppose Harlow defaults on day ten of its thirty day repo, and the notes have just fallen three per cent.
- What does Fenwick lose?
- Accrued interest for ten days is ninety eight million times four point five per cent times ten over three hundred and sixty, which is one hundred and twenty two thousand five hundred dollars.
- So Fenwick is owed ninety eight million, one hundred and twenty two thousand, five hundred.
- The notes, down three per cent, sell for ninety seven million.
- The shortfall is one million, one hundred and twenty two thousand, five hundred dollars.
- The haircut protected Fenwick only against a fall of up to about one point eight eight per cent.
- Daily variation margin would have topped up the collateral as prices slid.

14 Example 7: if Fenwick fails

Fenwick fails on day 10; the notes are still worth $100m

Collateral Harlow posted	market value	**$100,000,000**
Harlow owes Fenwick	98m + 122,500	**$98,122,500**
Harlow's excess at risk	100m − 98,122,500	**$1,877,500**
If the notes rose 1%	101m − 98,122,500	**$2,877,500**

IN THE LESSON

- Now reverse the roles.
- Suppose it is Fenwick that fails on day ten, while the notes are still worth one hundred million dollars.
- Harlow posted notes worth one hundred million.
- It owes Fenwick ninety eight million, one hundred and twenty two thousand, five hundred dollars, the cash plus accrued interest.
- The excess Harlow has at risk is one million, eight hundred and seventy seven thousand, five hundred dollars.
- It may never get those notes back, and in a failure it would be left with a claim for the excess.
- If the notes had risen one per cent, to one hundred and one million, the excess at risk would grow to two million, eight hundred and seventy seven thousand, five hundred.
- So the borrower faces counterparty risk too, and a bigger haircut makes it worse.

15 Liquidity risk sits with the borrower

- Liquidity risk: sits mainly with the borrower
- Short-dated repo funds longer-dated assets
- Lenders can refuse to roll the funding
- They can raise haircuts or demand more margin
- Borrower must find cash fast, or sell assets

IN THE LESSON

- Liquidity risk, the risk of not being able to meet cash needs when they fall due, sits mainly with the borrower.
- The reason is a mismatch.
- Short-dated repo, often overnight, funds assets the borrower holds for much longer.
- So the borrower depends on lenders to roll the funding, that is, to lend again each time it matures.
- Lenders can refuse to roll.
- They can raise haircuts, giving less cash for the same collateral.
- And they can demand more margin as collateral prices fall.
- Each of these forces the borrower to find cash quickly, and if it cannot, to sell assets, possibly at fire sale prices.

16 Example 8: Harlow's liquidity squeeze

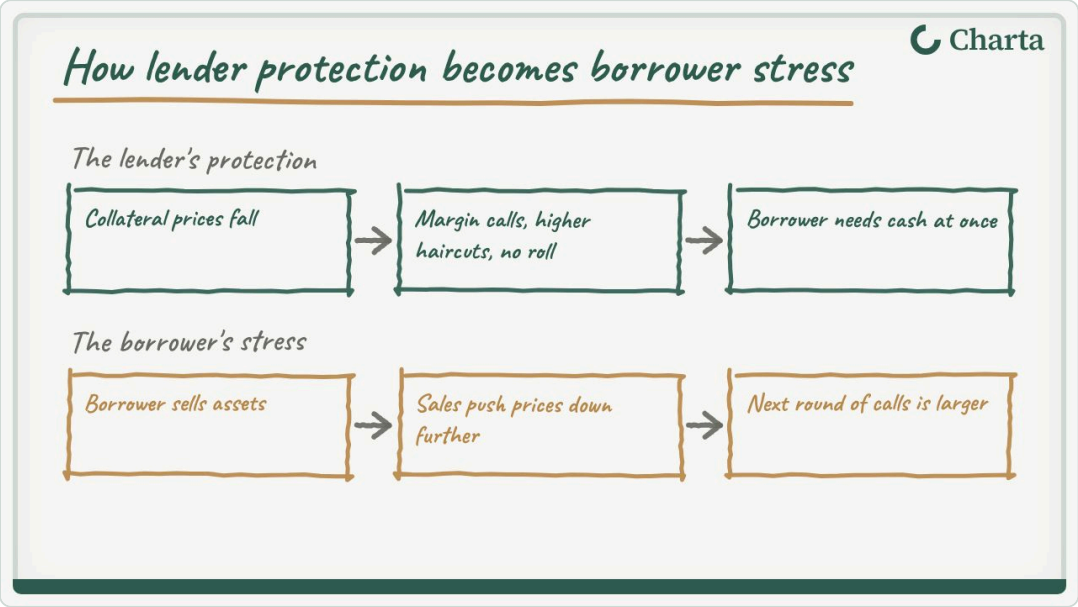
Harlow: $500m inventory funded with $490m of repo at a 2% haircut

Prices fall 4%	500m × (1 − 4%)	**$480m**
Cash at a 2% haircut	480m × 98%	**$470.4m**
Margin call	490 − 470.4	**$19.6m**
Haircut rises to 10%	470.4 − 480m × 90%	**$38.4m more**
Total cash to find	490 − 432	**$58.0m**

IN THE LESSON

- Return to Harlow's five hundred million dollar inventory, funded with four hundred and ninety million of repo at a two per cent haircut.
- Markets turn.
- Prices fall four per cent, so the inventory is now worth four hundred and eighty million.
- At the old two per cent haircut it supports only four hundred and seventy point four million of cash, so Harlow must post margin of nineteen point six million.
- Then lenders raise the haircut to ten per cent.
- Now the same collateral supports only four hundred and eighty million times ninety per cent, which is four hundred and thirty two million.
- So there is a further four hundred and seventy point four minus four hundred and thirty two, thirty eight point four million, to find.
- In total Harlow must find fifty eight million dollars of cash, at short notice, while its assets are falling.
- Each step protected the lenders.

17 How lender protection becomes borrower stress



IN THE LESSON

- This leads to the key point.
- Follow the boxes; the last one feeds back into the first.
- The top row is the lender's protection.
- First, collateral prices fall.
- Second, lenders protect themselves, with margin calls, higher haircuts, or a refusal to roll.
- Third, the borrower needs cash at once.
- The bottom row is the borrower's stress.
- The borrower sells assets to raise it.
- Those sales push prices down further, and the next box shows the result: the next round of margin calls is larger.
- So the protections that make the lender safe, the haircuts and the margin calls, do not make the risk disappear.
- They transfer stress into the borrower's liquidity needs.
- A borrower that looks well collateralised can still run out of cash.

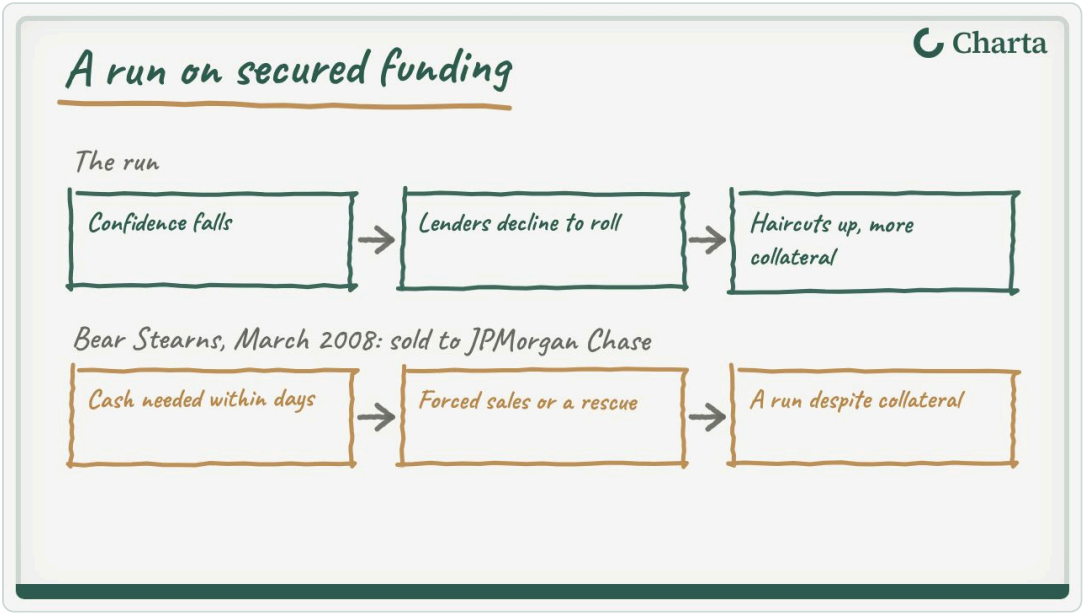
18 How Bear Stearns and Lehman were funded

- Two US dealers collapsed in 2008: Bear Stearns, Lehman
- Large inventories of longer-dated, less liquid assets
- Funded overnight and very short-term, mostly by repo
- A large part of the balance sheet rolled every day
- It relied on lenders coming back each morning

IN THE LESSON

- Repo funding played a central role in the collapses of two U S dealers in two thousand and eight, Bear Stearns and Lehman Brothers.
- Both had a funding model much like Harlow's, on a far bigger scale.
- They held large inventories of longer-dated and less liquid assets.
- They financed them with overnight and very short-term secured funding, mostly through repo.
- So a large part of each balance sheet had to be rolled every day.
- As long as lenders were confident, rolling was routine.
- But the whole model rested on lenders being willing to come back the next morning.

19 A run on secured funding



IN THE LESSON

- Here is how the run unfolded, box by box.
- First, confidence in the dealer falls.
- Second, repo lenders decline to roll.
- Third, those who stay raise haircuts or demand extra collateral.
- The bottom row is labelled with the first casualty, Bear Stearns, in March two thousand and eight, which was sold to J P Morgan Chase with central bank support.
- Read its boxes.
- Cash is needed within days, and Bear lost access to secured funding within days.
- That leaves forced sales or a rescue, and for Bear it was a rescue.
- The last box says it was a run despite collateral, even though every loan was secured.
- Collateral protects the lender against loss, but it gives the borrower no right to new funding tomorrow.

20 Lehman Brothers and Repo 105

- Lehman: Repo 105, repos accounted for as sales
- Securities left the balance sheet at quarter-ends
- Reported leverage looked lower than it really was
- Failed Sept 2008 as counterparties, clearing banks left
- Lesson: secured funding does not remove rollover risk

IN THE LESSON

- Lehman Brothers had the same rollover problem, with a twist.
- It used transactions called Repo one oh five.
- These were repos that it accounted for as sales, not as borrowings.
- At quarter-ends, the securities left the balance sheet, so its reported leverage, assets divided by equity, looked lower than it really was.
- Lehman failed in September two thousand and eight, as repo counterparties and clearing banks pulled back.
- The clearing banks are the banks that settle repo trades between dealers and lenders.
- The lesson for the exam is short: secured funding does not remove rollover risk.

21 Example 9: rollover and reported leverage

Made-up figures for Harlow. Amounts in US dollars

Overnight repo lost a day	15% × 12bn	**$1.8bn**
Days the cash reserve lasts	4.5bn ÷ 1.8bn	**2.5 days**
Leverage, as funded	30bn ÷ 1.5bn	**20 times**
3bn of repos booked as sales	assets 30 − 3	**$27bn**
Reported leverage	27bn ÷ 1.5bn	**18 times**

IN THE LESSON

- Two made up figures for Harlow, in U S dollars, show both effects.
- First, rollover.
- Harlow must roll twelve billion dollars of overnight repo.
- If lenders decline to roll fifteen per cent of it, Harlow loses one point eight billion of funding in a single day.
- Its cash reserve of four point five billion lasts only two and a half days at that pace.
- Second, reported leverage.
- Harlow has thirty billion dollars of assets and one point five billion of equity, a leverage of twenty times.
- If it books three billion of repos as sales, and uses the cash to repay other borrowing, assets fall to twenty seven billion and reported leverage to eighteen times.
- Harlow must still buy the securities back.

22 General collateral against special collateral

The cash lender's view: does it care which security it gets?

General collateral (GC)	Special collateral
Any security in a class	One specific security
Interchangeable	Scarce: someone needs it
Rate tracks short-term cash	Rate below the GC rate
Purpose: lend cash	Purpose: borrow the bond

IN THE LESSON

- So far Harlow's lenders did not care which Treasury notes they received.
- That is general collateral, or G C.
- Read the table row by row.
- In a G C repo, the cash lender accepts any security from an agreed class, such as U S Treasuries.
- In a special repo, the lender wants one specific security.
- The G C securities are interchangeable, while the special is scarce because someone needs that issue.
- The usual reason is to deliver against a short sale, as Kestrel did.
- The G C rate tracks the general short-term cash rate, while the special rate sits below the G C rate.
- In G C, the purpose is lending cash.
- In special, the trade is really about borrowing the bond.

23 Why special trades below GC

- The bond's owner is lending something scarce
- So the cash lender accepts a lower rate to get it
- GC rate − special rate = price of borrowing the bond
- Special rate should not exceed GC: owner can use GC
- Trap: special does not pay the cash lender more

IN THE LESSON

- Why is the special rate lower?
- In a special repo, the owner of the bond is lending something scarce, and the cash lender is the one who wants it.
- So the cash lender accepts a lower interest rate on its cash in order to obtain the bond.
- The gap between the G C rate and the special rate is the price of borrowing the security.
- There is also a ceiling.
- Any owner can always use the bond as ordinary G C collateral.
- So a special rate should not be above the G C rate, since no owner would accept worse terms for a scarce bond.
- The common error is to think that special collateral earns the cash lender a higher rate.
- It earns a lower one.

24 Example 10: Kestrel's price of borrowing the bond

Kestrel lends $36m for 10 days. GC 4.5%; the note's special rate 2.7%

Interest at GC	36m × 4.5% × 10 ÷ 360	**$45,000**
Interest at special	36m × 2.7% × 10 ÷ 360	**$27,000**
Price of borrowing the note	45,000 − 27,000	**$18,000**

IN THE LESSON

- Back to Kestrel's short.
- Kestrel lends thirty six million dollars for ten days, and it needs the on-the-run ten-year Treasury note as collateral.
- On-the-run means the most recently auctioned issue, which we meet properly soon.
- The G C rate is four point five per cent.
- Had Kestrel accepted any Treasury, it would have earned thirty six million times four point five per cent times ten over three hundred and sixty, which is forty five thousand dollars.
- Because it insists on that specific note, the repo rate is the special rate of two point seven per cent, so it earns only twenty seven thousand dollars.
- The difference, eighteen thousand dollars, is what Kestrel pays to borrow the note for ten days.

25 The special spread

Special spread = GC rate − Special rate
Quoted in basis points, and always ≥ 0

GC rate	Rate for any security in the class
Special rate	Rate on that one issue
Special spread	Demand to borrow versus supply

IN THE LESSON

- We can now name the gap.
- The special spread of an issue is the G C repo rate minus the repo rate on that specific issue.
- It is usually quoted in basis points, where one basis point is one hundredth of one per cent.
- Because the owner could always repo the bond at G C, the spread is zero or positive.
- Where does it come from?
- Specialness comes from demand to borrow a particular bond, mainly to cover short positions and hedges.
- That demand is set against the supply of the bond available to lend.
- When demand is high and supply is tight, the special rate is pushed well below G C and the spread widens.

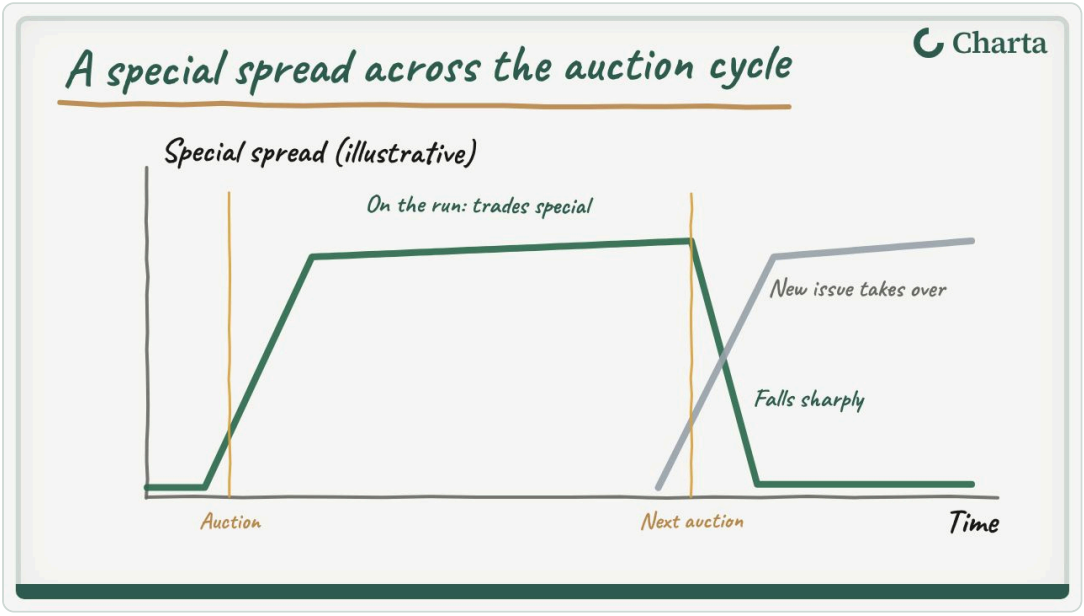
26 Specialness follows the auction cycle

- On-the-run: the most recently auctioned issue
- It is the one that tends to trade special
- Spread emerges around the auction, stays while on the run
- Next auction: demand moves, old spread falls sharply
- Specialness is temporary, tied to on-the-run status

IN THE LESSON

- In U S Treasuries, specialness follows the auction cycle.
- The Treasury sells new notes at regular auctions.
- The most recently auctioned issue of a maturity is called the on-the-run issue, and it is the one that tends to trade special.
- Traders favour it for short positions and hedges, so demand to borrow it is high.
- The spread emerges around the auction, and generally remains while the issue is on the run.
- When the next issue of that maturity is auctioned, demand moves to the new issue, and the old one's special spread falls sharply.
- The exam point is that specialness is temporary, and tied to on-the-run status.

27 A special spread across the auction cycle



IN THE LESSON

- This picture shows the pattern, with illustrative values.
- Along the bottom is time.
- Up the side is the special spread.
- The green line is one ten-year issue.
- It sits near zero before its auction, rises around the auction, and stays wide while the issue is on the run.
- Then it drops sharply.
- The grey line is the next ten-year issue, which takes over the specialness.
- The two gold lines mark the auctions.
- The first label shows the auction of the green issue, and the second shows the next auction.
- Above the green line, the label says that while on the run, it trades special.
- Next, after the next auction, its spread falls sharply.
- And the last label shows the new issue taking over.

28 Example 11: reading special spreads

GC rate 4.50%. One ten-year note, before and after the next auction

On the run: repo at 2.70%	4.50% − 2.70%	**180 bp**
After next auction: 4.32%	4.50% − 4.32%	**18 bp**
A quote of 4.60%, above GC	owner would use GC	**0, not −10**

IN THE LESSON

- Let us read some numbers, with G C still at four point five per cent.
- Harlow's on-the-run ten-year note repos at two point seven per cent.
- Its special spread is four point five minus two point seven, one point eight percentage points, which is one hundred and eighty basis points.
- After the next ten-year auction, the same note, now off the run, repos at four point three two per cent.
- Its spread is four point five minus four point three two, just eighteen basis points.
- Demand has moved to the new issue.
- Finally, suppose someone quotes a special rate of four point six per cent, above G C.
- No owner would accept it, because the owner could repo the note at G C instead.
- The spread should be zero, not minus ten basis points.

29 The financing benefit

Benefit = Cash × (GC − Special) × Days ÷ 360
Cash = Value × (1 − Haircut)

Benefit	Interest saved compared with GC
Cash	Cash borrowed, after haircut
GC − Special	Only the spread counts
Days ÷ 360	Repo days, 360-day year (US$)

IN THE LESSON

- Now the payoff for the owner.
- A bond that trades special can be financed by repo at the special rate, below G C, so its owner borrows cash more cheaply than the holder of ordinary collateral.
- The financing benefit is the interest saved compared with G C, written Benefit.
- Benefit equals Cash, times G C minus Special, times Days over three hundred and sixty.
- Two details matter.
- First, the base is the cash actually borrowed, which is the market value less the haircut, not the market value or the face amount.
- Second, only the spread counts.
- The interest at the special rate is still a cost, and is not the benefit.

30 Example 12: Harlow's financing benefit

Harlow repos $200m (market value) of the on-the-run note, 30 days, haircut 2%

Cash borrowed	200m × (1 − 2%)	**$196m**
Interest at GC (4.5%)		**$735,000**
Interest at special (2.7%)		**$441,000**
Benefit	196m × 1.8% × 30 ÷ 360	**$294,000**

Slips: on market value $300,000; special interest $441,000 is a cost

IN THE LESSON

- Harlow owns two hundred million dollars, at market value, of the on-the-run ten-year note, and repos it for thirty days with a two per cent haircut.
- The cash borrowed is one hundred and ninety six million dollars.
- At G C it would pay seven hundred and thirty five thousand dollars of interest.
- At the special rate it pays four hundred and forty one thousand.
- The spread is four point five minus two point seven, one point eight per cent.
- So the benefit is one hundred and ninety six million times one point eight per cent times thirty over three hundred and sixty, which is two hundred and ninety four thousand dollars, exactly the difference between those two.
- Two slips: using the market value, two hundred million times one point eight per cent for thirty days, gives three hundred thousand, and calling the special interest of four hundred and forty one thousand the benefit counts a cost.

31 Example 13: an auction during the repo

Cash $196m for 30 days. The next auction comes after day 20

Days 1-20: on the run	196m × 1.8% × 20 ÷ 360	**$196,000**
Days 21-30: off the run	196m × 0.18% × 10 ÷ 360	**$9,800**
Total benefit	196,000 + 9,800	**$205,800**

With large positions or leverage, the benefit can matter

IN THE LESSON

- Suppose instead that the next ten-year auction falls after twenty days of Harlow's thirty day holding period.
- If the spread is expected to change, compute the benefit period by period and add.
- For the first twenty days the note is on the run, with a spread of one point eight per cent.
- The benefit is one hundred and ninety six million times one point eight per cent times twenty over three hundred and sixty, which is one hundred and ninety six thousand dollars.
- For the last ten days the note is off the run, and the spread is only four point five minus four point three two, zero point one eight per cent, giving nine thousand eight hundred dollars.
- The total is two hundred and five thousand eight hundred dollars, well below the two hundred and ninety four thousand of a full special month.
- With large positions or leverage, a benefit of this size can matter.

32 Mistakes to avoid

- Interest on cash lent, not value; 360 days for US dollars
- Borrower of cash: repo. Lender of cash: reverse repo
- Collateral does not remove rollover or liquidity risk
- Special pays the cash lender less, not more
- Benefit: only the spread, on the cash borrowed

IN THE LESSON

- Before the quiz, here are the mistakes to avoid across the whole lesson.
- Charge repo interest on the cash lent, never on the market value of the collateral, and use a three hundred and sixty day year for U S dollars.
- Keep the labels straight: the cash borrower does the repo, and the cash lender does the reverse repo.
- Do not think collateral removes risk.
- Haircuts and margin calls protect the lender, and in doing so they shift stress onto the borrower's liquidity.
- Remember that special collateral pays the cash lender less, not more.
- And remember the financing benefit uses only the spread, applied to the cash borrowed.

33 Try three quick questions

1. Value $50m, haircut 3%, rate 4%, 45 days, 360-day year. Repurchase price?
   Answer: Cash 48.5m; interest $242,500; price $48,742,500.
2. GC 4.2%; one note repos at 3.6%. Special spread, and which issue?
   Answer: 60 bp; most likely the on-the-run issue.
3. Cash $120m, GC 4%, special 2.5%, 60 days. Financing benefit?
   Answer: 120m × 1.5% × 60 ÷ 360 = $300,000.

IN THE LESSON

- Now try three quick questions.
- Pause the video, think, then listen to the answers.
- Question one.
- Collateral is worth fifty million dollars, the haircut is three per cent, the repo rate is four per cent, and the term is forty five days, on a three hundred and sixty day year.
- What is the repurchase price?
- The cash is forty eight point five million, the interest is two hundred and forty two thousand five hundred, so the price is forty eight million, seven hundred and forty two thousand, five hundred dollars.
- Question two.
- G C is four point two per cent and one note repos at three point six per cent.
- What is its special spread, and which issue is it likely to be?
- Sixty basis points, most likely the on-the-run issue.
- Question three.
- Cash borrowed is one hundred and twenty million dollars, G C is four per cent, the special rate is two point five per cent, for sixty days.
- What is the financing benefit?
- Three hundred thousand dollars.