CHARTA LEARNING · LESSON NOTES

Fundamentals of Credit Risk

FRM Part II

1 A story: the bank and the frozen meals

- Harbourside Bank lends $5m to Marlow Foods
- Marlow pays for years, then its main customer leaves
- The bank recovers only part of what it lent
- Losses can also come without any default

IN THE LESSON

- Imagine Harbourside Bank lends five million dollars to Marlow Foods, a maker of frozen meals.
- Most years Marlow pays on time and the bank earns interest.
- Then one year a supermarket chain drops Marlow's products, sales collapse and the cash runs short.
- Harbourside gets back only part of what it lent.
- That is credit risk in its simplest form.
- But look closer.
- The bank could also be hurt if the rating agencies simply mark Marlow down, even though every payment arrives.
- And it could be hurt if it had lent to a dozen frozen food firms that all suffer together.
- The rest of this lesson makes those ideas precise.

2 What credit risk is

- Loss when a counterparty fails to pay in full and on time
- Or when its ability to pay deteriorates
- Default risk: the chance the obligor fails to pay
- Exposure risk: how much is owed when it does
- Recovery risk: how much comes back afterwards

IN THE LESSON

- Here is the definition.
- Credit risk is the risk of loss because a counterparty fails to meet a contractual obligation in full and on time, or because its ability to do so gets worse.
- A counterparty is simply the other side of a contract.
- Notice the second half: a deterioration in the ability to pay counts, even before any payment is missed.
- Now split the default loss into three uncertainties.
- Default risk is the chance that the obligor, the party that owes the money, fails to pay.
- Exposure risk is the uncertainty about how much is owed when that happens.
- Recovery risk is the uncertainty about how much is recovered afterwards.

3 Expected loss

EL = PD × EAD × LGD
LGD = 1 − recovery rate

Probability of default	Default risk: how likely
Exposure at default	Exposure risk: how much owed
Loss given default	Recovery risk: share lost

IN THE LESSON

- These three pieces combine into one number, the expected loss, which is the average credit loss over a horizon such as one year.
- It is the probability of default, times the exposure at default, times the loss given default.
- The probability of default, written P D, is how likely the obligor is to fail.
- The exposure at default, or E A D, is the amount owed at that moment.
- The loss given default, or L G D, is the share of that amount which is not recovered, so it equals one minus the recovery rate.
- Multiply the three together and you have the average loss.
- Expected loss is the part a lender prices into its loans, because on average it will happen.

4 Example 1: expected loss on Marlow's loan

Loan $5m. PD 3%, recovery 40%

Exposure at default	loan outstanding	**$5m**
Loss given default	1 − 40%	**60%**
Expected loss	3% × 60% × 5m	**$90,000**
Actual loss if Marlow defaults	60% × 5m	**$3m**

IN THE LESSON

- Let us compute it for Harbourside.
- The bank has lent Marlow five million dollars, so the exposure at default is five million.
- Its analysts give Marlow a three per cent chance of default over the year, and they expect to recover forty per cent.
- So loss given default is sixty per cent, not forty.
- Expected loss is point zero three times point six times five million, which is ninety thousand dollars.
- Now notice what that number is.
- If Marlow defaults, the real loss is three million dollars.
- If it does not, the loss is zero.
- Ninety thousand dollars is never the actual outcome.
- It is the average, and it is the price of doing business.

5 Losses that need no default

Four more ways credit risk comes about

Kind of risk	What goes wrong
Migration (downgrade)	Rating falls, value falls
Credit spread	Spreads widen, value falls
Concentration	Shared borrower, sector or region
Settlement	You deliver, they do not

IN THE LESSON

- Credit risk does not require a default.
- Migration risk, also called downgrade risk, is the chance that a borrower moves to a lower credit rating.
- The market then demands a higher yield from that borrower, so the value of its bonds and loans falls even though every payment is made.
- Credit spread risk is the broader version: spreads, the extra yield over a safe rate, can widen and cut values.
- Concentration risk arises when exposures share a borrower, a sector or a region, so one event hits many of them at once.
- Settlement risk arises when one side delivers what it owes and the other does not.
- We return to settlement later.

6 Example 2: a credit loss with no default

Marlow bonds, market value $10m. Two separate shocks

Downgrade: price 100 to 96	10m × 4%	**$0.4m**
Spreads +0.5%, duration 4	10m × 4 × 0.5%	**$0.2m**
Payments missed by Marlow	none	**0**
Defaults in the period	none	**0**

IN THE LESSON

- Here is a loss with no default.
- Harbourside also holds ten million dollars of Marlow bonds, valued at market prices.
- The rating agencies cut Marlow's rating, and the bond price falls from one hundred to ninety six.
- That is a four per cent fall, a loss of four hundred thousand dollars, and Marlow has not missed a payment.
- Separately, suppose credit spreads widen by half of one per cent.
- With a duration of four, a measure of how sensitive the price is to yield changes, the value falls by four times half of one per cent, which is two per cent, or two hundred thousand dollars.
- Both are credit losses, and no default occurred.

7 Where credit risk comes from

- Sources: loans, bonds, derivatives and guarantees
- Default, exposure and recovery combine in EL
- Downgrades and wider spreads cut value without default
- Usual mistake: equating credit risk with default alone

IN THE LESSON

- Where does credit risk come from in practice?
- There are four typical sources.
- Loans, where the borrower may not repay.
- Bonds, where the issuer may not pay interest or principal.
- Derivatives, where the counterparty may not pay what the contract says it owes.
- And guarantees, where a bank that issues one is exposed to its customer failing, because the bank must then pay the beneficiary.
- Put the whole picture together and you see the usual mistake.
- Many people equate credit risk with default alone.
- But downgrades, wider spreads and concentrations all cut value without any default, and every one of them is credit risk too.

8 Three words, three different things

- Insolvency: cannot pay debts when due (cash-flow test)
- Or liabilities exceed assets (balance-sheet test)
- Default: a missed payment or covenant breach
- Bankruptcy: a formal, court-supervised process
- Remember: condition, event, legal process

IN THE LESSON

- Now three words that people use as if they meant the same thing.
- They do not, and exam questions turn on the difference.
- Think of them as a condition, an event and a legal process.
- Insolvency is a financial condition.
- The debtor cannot pay its debts as they fall due, which is the cash-flow test, or its liabilities exceed its assets, which is the balance-sheet test.
- Default is an event.
- It is a failure to meet a contractual obligation, such as a payment, or a breach of a covenant, a promise in the loan contract such as keeping debt below a stated limit.
- A covenant breach is called a technical default.
- Bankruptcy is a legal status, which we cover next.

9 Condition, event, legal process

Three words that are not interchangeable

Word	What kind of thing it is
Insolvency	Condition: cannot pay, or owes more than owns
Default	Event: obligation missed or covenant breached
Bankruptcy	Legal status: court-supervised process

IN THE LESSON

- This table puts the three side by side.
- Insolvency is a condition, a state of the firm's finances, and it can exist for a long time before anyone acts on it.
- Default is an event, which happens on a particular date: a payment is missed, or a covenant is broken.
- Bankruptcy is a legal status.
- It is a formal, court-supervised process, such as liquidation, where assets are sold to repay creditors, or reorganisation, where the business carries on under a plan.
- A bankruptcy filing is usually itself listed as an event of default in loan and bond contracts, with the creditors' enforcement stayed, though the exact terms depend on the contract and the jurisdiction.
- So a filing normally means default, but default needs no filing.

10 Example 3: is Marlow insolvent? In default?

Marlow Foods, $ millions. Its parent funds every payment

Balance-sheet test	assets 42 − liabilities 48	**−6: insolvent**
Cash-flow test	cash 1 against 3 due	**short by 2**
Payments missed	parent pays on time	**none**
In default?	no event has occurred	**No**

IN THE LESSON

- Let us test Marlow Foods.
- Its assets are forty two million dollars and its liabilities are forty eight million.
- Under the balance-sheet test, liabilities exceed assets by six million, so Marlow is insolvent.
- Under the cash-flow test, it has one million in cash but three million of payments due this quarter, so it is short by two million and cannot pay as its debts fall due.
- Yet suppose Marlow's parent company keeps funding every payment on time.
- Then Marlow has missed nothing, so it is not in default.
- It is insolvent but not in default.
- The balance sheet is a condition.
- The event happens only if a payment is missed.

11 Insolvent, default and bankrupt in combination

Four combinations to recognise

Situation	Result
Insolvent, creditors forbear	Insolvent, no default
Solvent, temporary cash squeeze	Default while solvent
Covenant breached, payments made	Technical default
Files for court protection	Bankruptcy: usually default

IN THE LESSON

- Here are the combinations the exam likes.
- First, insolvent but not in default: creditors forbear, which means they agree to hold off, or a parent keeps funding the payments, as with Marlow.
- Second, in default but solvent: a firm with plenty of assets can suffer a temporary liquidity squeeze, a shortage of cash, and miss a payment.
- Third, a technical default: payments are made on time but a covenant is breached, so the lender may act.
- Fourth, a bankruptcy filing, a legal step that is usually itself an event of default.
- So the condition and the event are separate things.
- Always ask: does the question describe a condition, an event or a legal process?

12 Match each product to its exposure

Which exposure for which product

Product	How exposure is measured
Loan or bond	Amount advanced; known, one-way
Derivative	max(MtM, 0); uncertain, two-way
Line, guarantee, letter of credit	Drawn + expected draw of undrawn
Repo, securities lending	Lent − collateral, adjusted
FX settlement	Principal paid, if not received

IN THE LESSON

- Credit risk arises wherever a counterparty owes you value in future.
- Different products create different exposures, so match each product to how its exposure is measured.
- A loan or bond creates an exposure equal to the amount advanced or invested.
- It is known, and it runs one way.
- A derivative creates an exposure equal to its positive replacement value, written max of mark to market and zero.
- It is uncertain, moves with the market and can switch from one party to the other.
- Credit lines, commitments, guarantees and letters of credit are contingent.
- Repos and securities lending are secured, so collateral is deducted.
- And foreign exchange settlement puts the whole principal at risk.

13 Exposure on lines and guarantees

EAD = Drawn + CCF × Undrawn

Drawn amount	Already lent, counted in full
Undrawn limit	Limit not yet used
Conversion factor	Share expected to be drawn
Exposure at default	Amount owed at default

IN THE LESSON

- Take the contingent products first.
- A company with a credit line has not borrowed the whole limit, but it may draw more as it gets into trouble.
- So exposure at default is the drawn amount plus the share of the undrawn limit expected to be drawn by the time of default.
- That share is called the credit conversion factor, or C C F.
- A guarantee or a letter of credit works in the same way, because it becomes a real claim only if something goes wrong.
- Note that the conversion factor applies to the undrawn part only.
- The drawn part is counted in full.

14 Example 4: exposure on a credit line

Limit $20m, drawn $12m. CCF 35%, PD 3%, LGD 60%. $ millions

Undrawn limit	20 − 12	**8**
Expected extra draw	35% × 8	**2.8**
Exposure at default	12 + 2.8	**14.8**
Expected loss	3% × 60% × 14.8	**0.2664**
Drawn amount only	3% × 60% × 12	**0.216**

IN THE LESSON

- Harbourside gives Marlow a revolving credit line with a limit of twenty million dollars.
- Marlow has drawn twelve million, leaving eight million undrawn.
- The bank's analysis says that thirty five per cent of the undrawn part will have been drawn by the time of default.
- That extra draw is point three five times eight million, or two point eight million.
- Exposure at default is twelve plus two point eight, which is fourteen point eight million dollars.
- With the same three per cent default probability and sixty per cent loss given default, expected loss is point zero three times point six times fourteen point eight million, which is two hundred and sixty six thousand four hundred dollars.
- Using the drawn amount alone would give only two hundred and sixteen thousand.

15 Exposure on a derivative

Exposure = max(MtM , 0)
With netting and collateral: max(net MtM − collateral , 0)

Mark to market	Value of the trade to you
Collateral held	Security posted by the other side
Exposure	What you can lose if it defaults

IN THE LESSON

- Now derivatives.
- A loan has a known, one-way exposure.
- A derivative is different.
- Its value to you is its mark to market, the current market value.
- If that is positive, the counterparty owes you, and your exposure is that positive value, which is the cost of replacing the contract.
- If the mark to market is negative, you owe the counterparty, and your exposure is zero, because you still must pay.
- So exposure is the larger of mark to market and zero.
- It is uncertain, because it moves with the market, and it can switch from one party to the other.
- Netting, which offsets trades against each other, and collateral, assets posted as security, reduce it.

16 Example 5: netting and collateral

Two trades with Marlow, one netting agreement. $ millions

Without netting	only the +4 counts	**4.0**
Net value	4.0 − 1.5	**2.5**
Collateral held	posted by Marlow	**1.0**
Exposure	max(2.5 − 1.0, 0)	**1.5**

IN THE LESSON

- Harbourside has two trades with Marlow under a legally enforceable netting agreement.
- One is worth plus four million dollars to the bank and the other minus one and a half million.
- Counting only the positive trade would give four million.
- With netting, the values offset: four minus one point five is two point five million.
- Marlow has posted one million dollars of collateral.
- Exposure is the larger of two point five minus one, and zero, which is one point five million dollars.
- Netting and collateral have cut the exposure by more than half.
- And if the net value had been below the collateral, the exposure would have been zero, never negative.

17 Example 6: a repo and a falling collateral

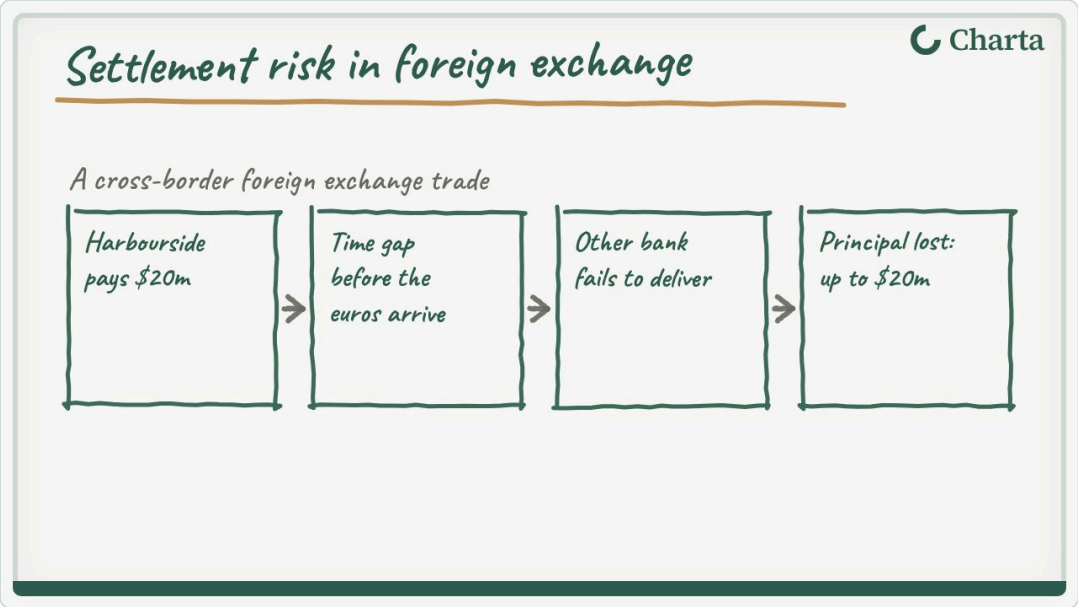
Cash lent $50m, securities held $52m. Securities fall 10%

Exposure at the start	max(50 − 52, 0)	**$0**
Collateral after the fall	52m × 90%	**$46.8m**
Exposure after the fall	50m − 46.8m	**$3.2m**
Why adjust for the fall?	sold only after default	

IN THE LESSON

- Repos and securities lending are secured.
- In a repo, Harbourside lends fifty million dollars in cash and holds securities worth fifty two million as collateral.
- At the start the cash lent is less than the collateral, so there is no exposure.
- But suppose Marlow defaults and the securities fall ten per cent in value before the bank can sell them.
- They are then worth ninety per cent of fifty two million, which is forty six point eight million.
- Exposure is the amount lent less the collateral value, fifty minus forty six point eight, which is three point two million dollars.
- This is why exposure is adjusted for any fall in collateral value before it is sold.

18 Settlement risk in foreign exchange



IN THE LESSON

- The last kind is settlement risk.
- Suppose Harbourside agrees to exchange twenty million dollars for euros with another bank, and the two payments are made in different countries at different times, because of time zones.
- Follow the boxes.
- Harbourside pays out its twenty million dollars.
- Hours pass before the euros are due.
- If the other bank fails in that gap and never delivers, Harbourside has lost the principal, the full amount it paid, not just a gain or loss from a price move.
- This is the loss of principal that makes cross-border foreign exchange special.
- Settling both payments together would remove the gap.

19 Ask: who has a claim on whom?

- Any party owed something in future carries credit risk
- Test: who has a claim on whom?
- The claimant bears the risk
- As values move, the position can change

IN THE LESSON

- Who carries credit risk?
- The test is simple: ask who has a claim on whom, because the claimant bears the risk.
- Any party that is owed something in future carries credit risk.
- That includes banks, but far more besides.
- A farmer who sells grain and waits thirty days for payment is a lender.
- A pension plan holding bonds is a lender.
- A person with money in a bank account is a lender to the bank.
- And because values move, the position can change.
- The party that is owed today may be the one that owes tomorrow, so the question must be asked again whenever values change.

20 The usual claimants and who owes them

The party that is owed carries the risk

Who is owed	Exposed to
Bank or other lender	Its borrowers
Bondholder, fund, pension plan	The issuer of the bond
Corporate selling on credit	Its customers (receivables)
Depositor	The bank, unless insured
Derivative counterparty	The other side, if MtM positive

IN THE LESSON

- Here are the standard cases.
- Banks and other lenders are exposed to their borrowers.
- Bondholders, funds and pension plans are exposed to the issuers of the bonds.
- A corporate that sells on credit is exposed to its customers, through receivables, which are the invoices not yet paid.
- Depositors are exposed to the bank holding their money, except where the deposits are insured.
- And derivative counterparties are exposed to each other, although only the party with positive market value has an exposure at that moment.
- Marlow shows it well: Harbourside is exposed to Marlow as lender, and Marlow's own suppliers, who wait for payment, are exposed to Marlow too.

21 Claims that are easy to miss

- Guarantee or CDS beneficiary: exposed to the seller
- Hedging replaces one credit risk with another
- Clearing: members exposed to the CCP, and it to them
- Insurers: reinsurance recoverables from reinsurers

IN THE LESSON

- Some claims are easy to miss.
- A beneficiary of a guarantee, credit insurance or a credit default swap, called a C D S, is exposed to the guarantor or the protection seller.
- So hedging replaces one credit risk with another.
- In clearing, members are exposed to the central counterparty, or C C P, which stands in the middle of their trades, and the central counterparty is exposed to them.
- Insurers carry reinsurance recoverables, the amounts they expect their own insurers, the reinsurers, to pay back after claims.
- In each case, trace the arrow of the claim.
- The party that is owed carries the risk, and the arrow can run in both directions.

22 Example 7: a hedge swaps one risk for another

Loan to Marlow hedged with a CDS from Seaview Re. Assume independence

Marlow defaults	chance, unhedged loss	**3%**
Seaview fails to pay	chance	**1%**
Hedged loss needs both	3% × 1%	**0.03%**
New obligor to watch	the protection seller	**Seaview Re**

IN THE LESSON

- Let us see hedging replace one risk with another.
- Harbourside has the five million dollar loan to Marlow, with a three per cent chance of default.
- It buys protection with a credit default swap from Seaview Re, an invented insurer.
- Seaview has a one per cent chance of failing over the period.
- Before hedging, the chance of a credit loss is three per cent.
- After hedging, the bank loses only if both Marlow defaults and Seaview fails to pay.
- If the two are independent, that is three per cent times one per cent, or point zero three per cent.
- Much safer, but not zero.
- If Seaview is likely to fail just when Marlow does, the true figure is higher.

23 Example 8: exposure that switches sides

One swap, two dates. Value to Harbourside, $ millions

Month 1: value to bank	swap is in the money	**+6**
Bank exposed to Marlow	max(6, 0)	**6**
Month 6: value to bank	rates moved the other way	**−2**
Bank exposed to Marlow	max(−2, 0)	**0**
Marlow exposed to bank	max(2, 0)	**2**

IN THE LESSON

- Now see exposure switch sides.
- Harbourside and Marlow enter an interest rate swap.
- In month one, interest rates move so that the swap is worth plus six million dollars to the bank.
- The bank is owed that value, so it has an exposure of six million to Marlow, and Marlow has none.
- By month six rates have moved the other way, and the swap is worth minus two million dollars to the bank.
- Now the bank owes, so its exposure is zero.
- Marlow is the party with positive value, so Marlow is exposed to Harbourside, for two million.
- Same contract, opposite exposure.
- A bank must watch both its own exposure and the changing position of its counterparty.

24 A story: the banker who refused all risk

- A bank that refuses all credit risk earns almost nothing
- Lending is the business: risk is the product
- The skill: take the risks that pay, avoid the rest
- Managing is not the same as eliminating

IN THE LESSON

- Why would a bank take credit risk at all?
- Picture a timid banker who decides never to lose a penny to default.
- She lends only to the very safest borrowers, asks for collateral worth more than every loan, and turns down anything uncertain.
- Her bank will lose very little.
- It will also earn very little, because safe borrowers pay low interest and most customers go elsewhere.
- Credit risk is the business that banks are in.
- The skill lies in managing it: taking the risks that pay, avoiding those that do not, and holding enough capital for the bad years.
- Managing credit risk does not mean eliminating it.

25 Why institutions manage credit risk

- Unmanaged losses threaten capital
- They raise funding costs and can cut ratings
- They make earnings unstable
- Regulators link required capital to credit risk

IN THE LESSON

- Why manage it at all?
- Because unmanaged credit losses threaten four things.
- First, capital: a big enough loss can wipe out the equity that protects depositors and lenders.
- Second, funding cost and ratings: a weak bank is charged more for its own borrowing and may be downgraded.
- Third, earnings stability: credit losses make profits swing from year to year, which investors dislike.
- And fourth, regulators link the capital a bank must hold to its credit risk, so riskier lending needs more capital, which is expensive.
- So institutions set policies and limits to keep credit risk within what they can afford and are paid to bear.

26 Why accept it: what the spread pays for

Spread ≥ EL rate + Capital charge + Operating cost

Expected loss rate	PD × LGD: losses we expect
Capital charge	Cost of equity held for UL
Operating cost	Cost of running the loan
Spread	Charged over the safe rate

IN THE LESSON

- Now the other side: why accept it.
- Lending margins and credit spreads compensate the lender for three things.
- First, expected loss, the average loss that will happen in any portfolio.
- Second, the cost of the capital held against unexpected loss, the loss beyond the average that a bad year could bring.
- Third, the operating costs of running the loan.
- If the spread covers all three, the loan earns its place.
- A loan priced below that sum destroys value, even if it never defaults.
- Here we express each part as a percentage of the loan, per year.

27 Example 9: the minimum spread on Marlow's loan

Loan $5m, PD 3%, LGD 60%. Capital 8% of loan, cost of capital 10%

Expected loss rate	3% × 60%	**1.8%**
Capital charge	8% × 10%	**0.8%**
Operating cost	per year	**0.4%**
Minimum spread	1.8 + 0.8 + 0.4	**3.0%**

IN THE LESSON

- Let us price Marlow's five million dollar loan.
- Expected loss is three per cent times sixty per cent, which is one point eight per cent of the loan a year.
- Next, suppose the bank holds capital equal to eight per cent of the loan against unexpected loss, which is four hundred thousand dollars, and its shareholders require a ten per cent return on that capital.
- The capital charge is eight per cent times ten per cent, which is point eight per cent of the loan.
- Operating costs are point four per cent.
- Adding one point eight, point eight and point four, the minimum spread is three per cent, or one hundred and fifty thousand dollars a year.
- Charging less loses money in the long run.

28 The toolkit for managing credit risk

Five tools, five jobs

Tool	How it helps
Limits on names and sectors	Cap the size of one loss
Diversification	Spread across names, sectors, regions
Collateral and netting	Cut exposure after default
Pricing	Spread covers EL and capital
Credit derivatives, securitisation	Transfer risk to others

IN THE LESSON

- Banks have a toolkit for managing credit risk.
- Limits on single names and sectors cap how much any one failure can cost.
- Diversification spreads exposures across borrowers, sectors and regions, so that they do not fail together.
- Collateral and netting cut the exposure that remains when a counterparty defaults.
- Pricing, as we have seen, makes the spread cover expected loss and capital.
- And credit derivatives and securitisation transfer risk to other parties by selling it on.
- Each tool has a cost, and no tool removes credit risk entirely.

29 Transfer has costs: why keep some risk

- Transfer has costs: basis risk and counterparty risk
- It may damage the client relationship
- Small or well-priced exposures can be kept
- Credit risk is managed, priced and limited, not avoided

IN THE LESSON

- Transferring risk is not free.
- A credit derivative leaves basis risk, because the hedge may not match the loan exactly, and it creates counterparty risk, because the protection seller may fail.
- Selling or hedging a loan may also damage the relationship with a client who expected the bank to hold it.
- So retaining a small exposure, or one that is well priced, can be perfectly rational.
- The decision rule is risk-adjusted: transfer or reduce what you are not paid enough to bear, and keep what you are.
- Credit risk is managed, priced and limited, not avoided.

30 The decision rule: RAROC against the hurdle

RAROC = (Revenue − Costs − EL) ÷ Capital
Accept if RAROC > hurdle rate

Return after EL and costs	Revenue less costs less EL
Capital held	Capital held against the risk
Hurdle rate	Return shareholders require

IN THE LESSON

- The decision rule is risk-adjusted.
- Accept a risk when the return on capital, after expected loss and costs, exceeds the hurdle rate.
- A common way to measure this is R A R O C, risk-adjusted return on capital.
- Take the revenue the exposure earns, subtract operating costs and subtract expected loss.
- Divide what is left by the capital held against the exposure.
- The result is a percentage return on capital.
- Compare it with the hurdle rate, the minimum return shareholders require.
- If R A R O C is above the hurdle, the exposure creates value.
- If it is below, reprice it, reduce it or transfer it.
- Definitions of costs and capital vary between banks.

31 Example 10: accept or reprice?

Loan $5m. EL $90,000, costs $20,000, capital $400,000, hurdle 10%

Revenue at 3.4%	3.4% × 5m	**$170,000**
Left after costs and EL	170k − 20k − 90k	**$60,000**
RAROC at 3.4%	60k ÷ 400k	**15%: accept**
Revenue at 2.8%	2.8% × 5m	**$140,000**
RAROC at 2.8%	30k ÷ 400k	**7.5%: reject**

IN THE LESSON

- Back to Marlow's five million dollar loan.
- Expected loss is ninety thousand dollars, operating costs are twenty thousand, and the bank holds four hundred thousand dollars of capital against it.
- The hurdle rate is ten per cent.
- First, suppose the bank charges three point four per cent, so revenue is one hundred and seventy thousand dollars.
- Revenue less costs less expected loss is sixty thousand, and sixty over four hundred is fifteen per cent, above the hurdle: accept.
- Now suppose Marlow negotiates revenue down to two point eight per cent, or one hundred and forty thousand.
- What is left is thirty thousand, which is seven point five per cent, below the hurdle: reject or reprice.

32 Mistakes to avoid

- Credit risk is not default alone
- LGD is one minus recovery, not the recovery rate
- Insolvency: condition. Default: event. Bankruptcy: process
- Derivative exposure is max(MtM, 0), not MtM
- A hedge replaces credit risk with the seller's

IN THE LESSON

- Five mistakes catch learners out.
- Mistake one: equating credit risk with default alone, when downgrades, wider spreads and concentrations also cause loss.
- Mistake two: using the recovery rate where loss given default belongs.
- Mistake three: mixing up the three words.
- Insolvency is a condition, default is an event, and bankruptcy is a legal process, and a firm can be insolvent without being in default, or in default while solvent.
- Mistake four: treating a derivative's exposure as its value, when it is the larger of the value and zero.
- Mistake five: thinking a hedge removes credit risk, when it moves the risk to the protection seller.

33 Recap: the main ideas

- Credit risk: loss from failure or weaker ability to pay
- EL = PD × EAD × LGD; losses also arise without default
- Condition, event, legal process; match product to exposure
- The claimant bears the risk; hedges swap risks
- Accept if RAROC beats the hurdle; manage, not avoid

IN THE LESSON

- Let us pull it together.
- Credit risk is the risk of loss when a counterparty fails to pay in full and on time, or its ability to pay deteriorates.
- Default, exposure and recovery risk combine in expected loss, and downgrades, spreads, concentrations and settlement add losses without default.
- Insolvency is a condition, default an event and bankruptcy a legal process.
- Loans, derivatives, commitments, repos and foreign exchange settlement each have their own exposure measure.
- The claimant bears the risk, and hedging swaps one risk for another.
- Banks accept credit risk deliberately, price it and limit it, and keep it when risk-adjusted return beats the hurdle.

34 Try three quick questions

1. Loan $8m, PD 2%, recovery 25%. Expected loss?
   Answer: LGD 75%. 2% × 75% × 8m = $120,000.
2. Line $30m, drawn $18m, CCF 25%. Exposure at default?
   Answer: 18m + 25% × 12m = $21m.
3. Liabilities exceed assets; parent pays all on time. Insolvent? In default?
   Answer: Insolvent: yes. In default: no, no payment missed.

IN THE LESSON

- Now try three quick questions.
- Pause the video, think, then listen to the answers.
- Question one.
- A bank lends eight million dollars.
- The default probability is two per cent and the recovery rate is twenty five per cent.
- What is the expected loss?
- Loss given default is seventy five per cent, so point zero two times point seven five times eight million is one hundred and twenty thousand dollars.
- Question two.
- A credit line has a limit of thirty million dollars, of which eighteen million is drawn, and twenty five per cent of the undrawn part is expected to be drawn by default.
- What is the exposure at default?
- Eighteen plus a quarter of twelve is twenty one million dollars.
- Question three.
- A firm's liabilities exceed its assets, but its parent pays every instalment on time.
- Is it insolvent, and is it in default?
- It is insolvent, but not in default.