CHARTA LEARNING · LESSON NOTES

# Margin (Collateral) and Settlement

FRM Part II

## 1 A story: a swap that moved

- Meridian Bank swaps payments with Tallis Capital
- Netted, Tallis owes Meridian $9.35m today
- If Tallis fails, that money may be lost
- Collateral: assets Tallis hands over as security
- Meridian = secured party; Tallis = pledgor

IN THE LESSON

- Let us meet our running example.
- Meridian Bank has a large set of interest rate swaps with a hedge fund called Tallis Capital.
- A swap is a contract to exchange payments.
- When the trades are added together, a step called netting, in which gains on some offset losses on others, rates have moved so that Tallis owes Meridian a net nine point three five million dollars.
- Meridian is exposed to the credit of Tallis.
- If Tallis failed today, that money might never arrive.
- So Meridian asks Tallis to hand over assets as collateral, something of value held as security.
- The party that receives the collateral is the secured party, here Meridian.
- The party that posts it is the pledgor, here Tallis.

## 2 Why collateral is managed

- Main practical tool for cutting counterparty exposure
- On default: sell the assets, apply proceeds to the debt
- Lower exposure: lower loss given default and lower CVA
- Frees credit limits and regulatory capital
- Opens business with weaker unsecured credits

IN THE LESSON

- Collateral is managed because it is the main practical tool for cutting counterparty credit exposure in derivatives and in repo, which is a loan secured by securities.
- If the counterparty defaults, the secured party can sell the assets it holds and apply the proceeds to the net amount owed, so the loss given default falls.
- Lower expected exposure also reduces the credit valuation adjustment, the C V A, which is the price adjustment for the counterparty's credit risk.
- It frees credit limits and regulatory capital.
- And it lets a bank trade with counterparties whose unsecured credit standing would not otherwise support the business at all.

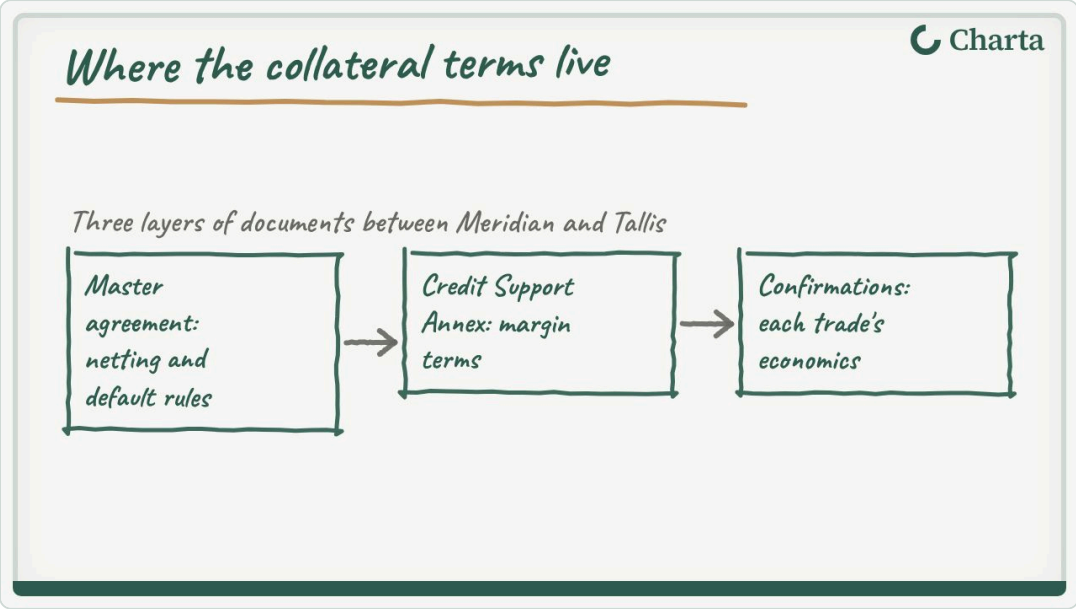
## 3 What collateral cannot do

- Margin period of risk: last good call to close-out
- Exposure can still grow during that period
- Threshold and MTA leave small unsecured gaps
- Collateral can lose value, or be wrong-way
- Reduces and transforms risk; never eliminates it

**IN THE LESSON**

- Now the warning.
- Collateral does not remove risk.
- Exposure can still grow during the margin period of risk, which is the time from the last successful margin call to close-out, when the position is finally ended.
- Suppose Tallis misses a call.
- Meridian must notice, give notice, wait, and then close out, and markets keep moving all that time.
- Thresholds and minimum transfer amounts, which we meet shortly, leave small gaps that are never covered.
- Collateral can also lose value, or be tied to the counterparty itself, which is wrong-way risk.
- The exam point is that collateral reduces and transforms credit risk, but does not eliminate it.

## 4 Where the collateral terms live




**IN THE LESSON**

- A collateral agreement is usually written as a Credit Support Annex, or C S A, to the I S D A Master Agreement.
- I S D A stands for the International Swaps and Derivatives Association, whose standard contracts most derivatives dealers use.
- Follow the boxes.
- The master agreement is the framework for all trades between the two firms.
- It holds the netting and default rules.
- The Credit Support Annex holds the margin terms: how much collateral, of what kind, and when it moves.
- Each individual trade is then recorded in a confirmation, which holds the trade economics.
- The terms of margining stay in the annex, not in the confirmations.

## 5 The main CSA terms

*Five terms you must be able to define*

| Term | What it does |
|---|---|
| Credit support amount | Collateral required now |
| Threshold | Unsecured exposure tolerated |
| Minimum transfer amount | Smallest call actually made |
| Rounding | Call up, return down |
| Independent amount (IM) | Posted whatever the exposure |

**IN THE LESSON**

- Here are the main terms.
- The credit support amount is the collateral required at a given moment.
- The threshold is the amount of unsecured exposure one side tolerates before collateral is called.
- The minimum transfer amount, M T A, is the smallest call that will actually be made, which avoids operational noise from tiny transfers.
- Rounding forces every transfer to a set multiple, with delivery amounts rounded up and return amounts rounded down.
- The independent amount, also called initial margin, is posted whatever the current exposure is.
- It is a buffer against exposure growing during the margin period of risk.

## 6 Eligible collateral, haircuts, and a common mistake

- Eligible assets and credit quality: set in a schedule
- Haircut cuts each asset's value against price moves
- Value counted = market value × (1 − haircut)
- Threshold and MTA are NOT the same thing
- Together they set the maximum unsecured exposure

**IN THE LESSON**

- Two more terms.
- Eligible collateral and its credit quality are set in a schedule: which assets are accepted, and how strong the issuer must be.
- Each asset has a haircut, a cut to its value that protects against price moves before it can be sold.
- A bond with a market value of one hundred and a four per cent haircut counts for ninety six.
- Now the common mistake: treating threshold and minimum transfer amount as the same thing.
- They are different.
- The threshold is a standing allowance.
- The minimum transfer amount only stops small calls.
- Together they set the maximum unsecured exposure, the most that can be owed before collateral must move.

## 7 The credit support amount

**Required = max( Exposure + IA − Threshold , 0 )**

| | |
|---|---|
| **Exposure** | Value of the trades owed to us |
| **Independent amount, IA** | Posted whatever the exposure |
| **Threshold** | The pledgor's unsecured allowance |
| **Collateral required** | Never below zero |

**IN THE LESSON**

- Now to the calculation.
- The collateral required is the exposure, plus the independent amount, less the threshold, and never below zero.
- Exposure is what the valuation of the trades says the pledgor owes.
- The independent amount is the one the pledgor posts in favour of the secured party, so it adds to what is required.
- The threshold is the pledgor's own unsecured allowance, so it is subtracted.
- Read the signs carefully.
- More exposure means more collateral.
- More threshold means less.
- The floor at zero matters, because a negative number would mean the pledgor needs nothing, not that the secured party owes collateral.

## 8 The margin-call sequence

*Five steps, always in this order*

| | | |
|---|---|---|
| **1 Collateral required** | Exposure + IA − Threshold, ≥ 0 | **Required** |
| **2 Collateral held** | Market value × (1 − haircut) | **Held** |
| **3 Compare** | Required − held | **Call or return** |
| **4 MTA test** | Below MTA: nothing moves | **Pass or stop** |
| **5 Round** | Call up, return down | **Final amount** |

IN THE LESSON

- Follow the same five steps every time.
- First, work out the collateral required, using the formula we just saw.
- Second, value the collateral already held, each asset at market value times one minus its haircut.
- Third, compare.
- If required is more than held, the difference is a delivery amount, also called a call.
- If held is more than required, the difference is a return amount.
- Fourth, apply the minimum transfer amount.
- If the difference is below it, nothing moves.
- Fifth, round to the stated multiple, delivery amounts up and return amounts down.
- Work through each step in order and the answer follows.

## 9 Example 1: a delivery call

*Exp 9.35, IA 1.0, TH 3.0, MTA 0.5, round 0.25. Held: cash 2.0, bonds 4.0 (4% haircut). $m*

| | | |
|---|---|---|
| **Collateral required** | 9.35 + 1.0 − 3.0 | **7.35** |
| **Collateral held** | 2.0 + 3.84 (4.0 × 0.96) | **5.84** |
| **Shortfall** | 7.35 − 5.84 | **1.51** |
| **MTA test** | 1.51 ≥ 0.50, so call | **Pass** |
| **Delivery amount** | 1.51 rounded up to 0.25 | **1.75** |

IN THE LESSON

- Here are the terms between Meridian and Tallis.
- Exposure is nine point three five million dollars.
- The independent amount is one million, the threshold three million, the minimum transfer amount half a million, and rounding is to a multiple of a quarter million.
- Required collateral is nine point three five plus one minus three, which is seven point three five million.
- Meridian already holds two million in cash and four million in government bonds posted by Tallis, with a four per cent haircut.
- The bonds count for three point eight four, so held collateral is five point eight four.
- The shortfall is one point five one million.
- That is above the half million minimum, so a call is made, rounded up to one point seven five million.

## 10 Example 2: three more scenarios

*Same terms, collateral held 5.84. Exposure changes. $ millions*

| | | |
|---|---|---|
| **Exposure 7.2: required 5.20** | Excess 0.64 ≥ MTA, round down | **Return 0.50** |
| **Exposure 7.6: required 5.60** | Excess 0.24 < MTA | **Nothing moves** |
| **Exposure 1.8: 1.8 + 1.0 − 3.0** | Negative, floored at 0 | **Required 0** |
| **Exposure 1.8: return** | 5.84 rounded down to 0.25 | **Return 5.75** |

IN THE LESSON

- Now keep the same terms and the same held collateral of five point eight four million, and let the exposure move.
- In the first scenario, exposure falls to seven point two million.
- Required becomes five point two million, so held collateral is too high by point six four.
- That clears the minimum transfer amount, and rounding down to a quarter million gives a return of half a million.
- In the second, exposure is seven point six million.
- The excess is only point two four, below the minimum, so nothing moves.
- In the third, exposure collapses to one point eight million.
- Exposure plus independent amount less threshold is negative, so required is floored at zero, and the return is five point seven five million.

## 11 Mistakes in the margin calculation

- Forgetting the haircut: call 1.50, not 1.75
- Threshold added instead of subtracted: 13.35, not 7.35
- Skipping the MTA test
- Rounding the wrong way: calls up, returns down
- Work the five steps in order

IN THE LESSON

- Four mistakes appear again and again.
- First, forgetting the haircut on securities.
- In our example, counting the bonds at four million instead of three point eight four makes held collateral six, the shortfall one point three five, and the call only one point five, a quarter million too small.
- Second, subtracting the threshold the wrong way.
- Adding it would give required collateral of thirteen point three five million instead of seven point three five.
- Third, skipping the minimum transfer amount test, which would send tiny calls.
- Fourth, rounding in the wrong direction.
- Round delivery amounts up and return amounts down, so the secured party is never under-collateralised by rounding.

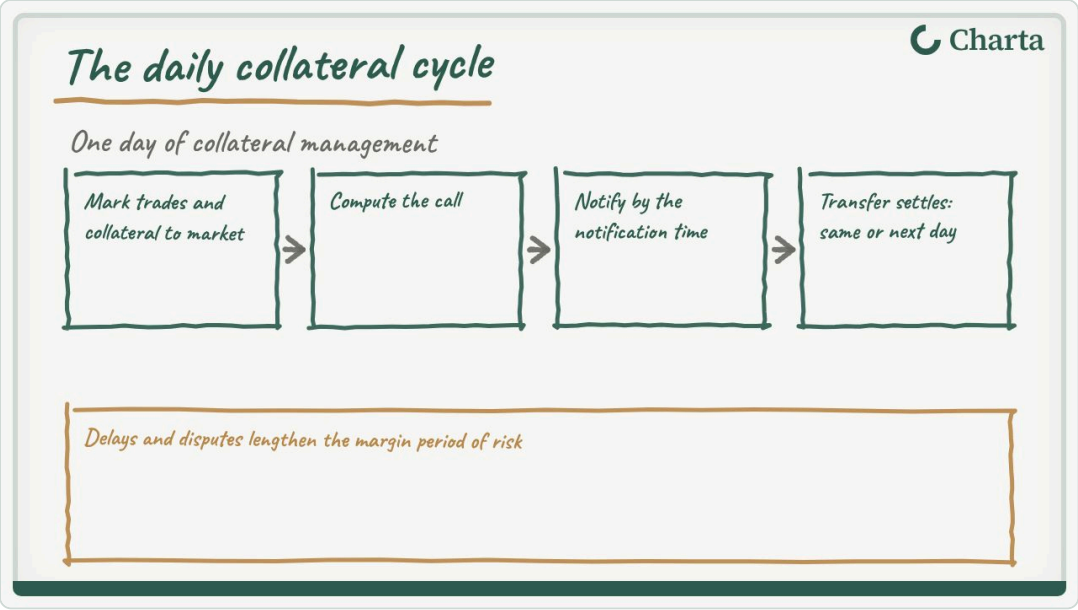
## 12 The valuation agent

- Calculates exposure and values collateral held
- Works out the credit support amount, issues the demand
- Often the party making the demand
- Does not hold collateral and does not decide defaults
- Can be challenged: the agreement sets a process

IN THE LESSON

- The valuation agent is the party, or a designated third party, responsible for calculating the exposure under the underlying transactions and valuing the collateral already held.
- It also works out the credit support amount and issues the delivery or return demand to the counterparty by the notification time.
- In many standard agreements the party making the demand acts as valuation agent, so in a two way agreement each side performs the role when it calls.
- The agent does not hold the collateral, which is the custodian's job, and does not decide defaults.
- Because the agent is normally an interested party, the other side can dispute a calculation.
- Accurate trade data, consistent market data and valuation timing prevent disputes.
- Link the role to calculating and calling.

## 13 The daily collateral cycle




### IN THE LESSON

- In practice, collateral works through a daily cycle.
- Follow the boxes from left to right.
- First, the valuation agent marks the portfolio and the collateral to market, which means revaluing both at today's prices.
- Second, it computes the call, using the five steps we just practised.
- Third, it notifies the counterparty by the notification time written in the agreement.
- Fourth, the transfer settles, on the same or the next business day.
- Then the cycle repeats the next day.
- Every delay in this chain, such as a late valuation, a settlement failure or an unresolved dispute, lengthens the margin period of risk, because exposure goes on growing while the collateral is in transit.

## 14 The kinds of collateral

*Most to least common. Any foreign-currency asset adds an FX haircut*

| Collateral | Notes |
|---|---|
| Cash, base currency | Overnight interest, no haircut |
| Government securities | Haircut by maturity |
| Agency, high grade bonds | Larger haircut |
| Equities, gold, letters of credit | Occasional, larger haircut |

### IN THE LESSON

- Which assets are used?
- Cash is the most common, typically in major currencies, and the receiver pays interest on it at an overnight rate.
- Government securities are also widely used.
- Next come agency bonds and high grade corporate bonds, and occasionally equities, gold or letters of credit, which are bank promises to pay.
- Non cash assets carry a haircut.
- The haircut grows with the price volatility of the asset and with its maturity, so a long bond is cut more than a short one.
- An asset in a foreign currency carries an extra currency haircut on top, to cover movements in the exchange rate.

## 15 Haircuts and the cheapest to deliver

- Haircut grows with volatility and maturity
- Foreign-currency assets: extra FX haircut
- Several eligible assets: pledgor delivers the cheapest
- Cheapest to deliver = embedded option for the pledgor
- Delays and disputes lengthen the margin period of risk

**IN THE LESSON**

- Why are haircuts bigger for riskier assets?
- The secured party may have to sell the asset after a default, and the more its price swings, the more value may be lost before the sale.
- The haircut is the protection.
- A second practical point arises when several kinds of asset are eligible.
- The pledgor will tend to deliver whichever is cheapest to deliver, the asset it values least or that costs it the least to give up.
- That gives the secured party less than it might have hoped for, and practitioners describe it as an embedded option held by the pledgor.
- Remember that settlement delays and disputes lengthen the margin period of risk, just as we saw.

## 16 Why collateral disputes arise

- Mismatched trade populations
- Different models, market data or timing
- Different valuation of the collateral
- Errors in the agreement's terms
- Disagreement is about how much, not whether

**IN THE LESSON**

- A collateral dispute arises when the two parties compute different calls.
- Meridian calls for one point seven five million, but Tallis says the right figure is lower.
- Why might that be?
- The typical causes are mismatched trade populations, where one side has a trade the other does not have booked.
- Or different valuation models, market data or timing, so the same swap gets two prices.
- Or different valuation of the collateral itself.
- Or simple errors in the terms of the agreement.
- In every case the disagreement is not about whether collateral is owed, but about how much.
- Left alone, a dispute stops collateral moving, and exposure grows while the argument goes on.

## 17 Example 3: resolving a dispute

*Meridian calls 1.75. Tallis computes 1.25. $ millions*

| | | |
|---|---|---|
| **Meridian's call** | Valuation agent's demand | **1.75** |
| **Tallis's own figure** | Its own calculation | **1.25** |
| **Undisputed: pay now** | The part both accept | **1.25** |
| **Disputed balance** | 1.75 − 1.25: quotes decide | **0.50** |
| **Withholding all 1.75** | Risks an event of default | **Wrong** |

**IN THE LESSON**

- Here is the usual process.
- Meridian calls for one point seven five million dollars.
- Tallis computes only one point two five million.
- The disputing party notifies promptly.
- It must then transfer the undisputed amount without delay, which is one point two five million, the part both sides accept.
- The disputed balance of half a million is resolved afterwards, often by recalculating with quotes from reference market makers, or with the party's own pricing evidence.
- Over the longer term, portfolio reconciliation, comparing trade by trade valuations and data, removes the causes.
- The exam trap is that a dispute does not excuse withholding the undisputed part.
- Failing to deliver that part can become an event of default.

## 18 What a collateral agreement contains: commercial terms

*Four groups of commercial terms*

| Group | Contents |
|---|---|
| Parties | Names and base currency |
| Credit terms | Threshold, MTA, rounding, IA |
| Eligible collateral | Assets, haircut for each |
| Process | Valuation agent, times, settlement |

**IN THE LESSON**

- Now what does a collateralization agreement, normally a Credit Support Annex under an I S D A Master Agreement, actually contain?
- It holds the commercial terms for margining.
- First, it names the parties and the base currency, the currency in which all amounts are measured.
- Second, it sets the credit terms for each party: the threshold, the minimum transfer amount, the rounding and any independent amount.
- Third, it lists eligible collateral and the haircut on each asset and currency.
- Fourth, it fixes the process: the valuation agent, the valuation and notification times, and the settlement timing.
- Each term does one job, and you should know the list and what each does.

## 19 What a collateral agreement contains: legal and operating terms

- Interest on cash, substitution, reuse rights
- Custody arrangements and dispute resolution
- Default, termination, rating triggers
- Governing law: pledge or title transfer
- Trade economics stay in confirmations

**IN THE LESSON**

- The agreement also covers practical and legal points.
- It sets interest on cash collateral, the right to substitute one asset for another, and the right to reuse or rehypothecate the collateral, which we meet shortly.
- It fixes the custody arrangements, how disputes are resolved, and what happens at default or termination, including rating triggers.
- The governing law decides whether the structure is a pledge or a title transfer.
- In a pledge the pledgor keeps ownership.
- In a title transfer, ownership passes to the receiver.
- What the agreement does not hold is the trade economics, such as the fixed rate or notional of a swap, which stay in the confirmations.

## 20 One-way against two-way

*Who posts: the whole difference*

| | One-way | Two-way |
|---|---|---|
| Who posts | One party | Both, by exposure |
| Typical when | Big credit gap | Similar credits |
| Other party posts | Nothing | Only when it owes |
| Direction of flow | Fixed | Follows exposure |

**IN THE LESSON**

- A one way agreement requires only one party to post collateral, while the other posts nothing.
- It is typical when one side has much weaker credit, or when a strong party, such as a highly rated corporate or a supranational institution, will not post.
- A two way, or bilateral, agreement requires both sides to post, depending on whose exposure is positive.
- If Meridian is owed money, Tallis posts.
- If the swaps move the other way and Meridian owes Tallis, then Meridian posts.
- The exam point is simple: one way against two way is about who posts.
- It says nothing yet about how much is required.

## 21 Example 4: rating-dependent thresholds

*Illustrative schedule. Exposure 6.0, IA 0. $ millions*

| | | |
|---|---|---|
| **Rated A: threshold 5.0** | 6.0 − 5.0 | **Call 1.0** |
| **Rated BBB: threshold 1.0** | 6.0 − 1.0 | **Call 5.0** |
| **Below BBB: threshold 0** | 6.0 − 0 | **Call 6.0** |
| **Downgrade A to BBB adds** | 5.0 − 1.0 | **4.0 more** |

**IN THE LESSON**

- Collateral parameters often depend on credit quality.
- Thresholds are set by rating, falling toward zero as the rating drops.
- Minimum transfer amounts and haircuts can tighten, and a downgrade can trigger an additional call or a termination event.
- Here is an illustration.
- Exposure to Tallis stays at six million dollars, with no independent amount.
- At a rating of single A the threshold is five million, so the call is one million.
- After a downgrade to triple B the threshold is one million, so the call is five million.
- Below triple B the threshold is zero and the call is six million.
- The downgrade adds four million exactly when Tallis is under stress.
- That is the cliff effect.

## 22 Example 5: the funding cost of collateral

*Tallis posts $10m cash. Collateral rate 3.5%, own funding cost 5.0%*

| | | |
|---|---|---|
| **Interest earned on cash** | 10m × 3.5% | **$350,000** |
| **Cost of funding the cash** | 10m × 5.0% | **$500,000** |
| **Net cost to the pledgor** | 500,000 − 350,000 | **$150,000** |
| **Receiver's gain** | Own funding cost − 3.5% | **Opposite sign** |

**IN THE LESSON**

- Now some practical consequences.
- Posting cash or securities has a funding cost.
- Suppose Tallis posts ten million dollars in cash.
- The pledgor earns the overnight collateral rate on that cash, say three point five per cent, which is three hundred and fifty thousand dollars a year.
- But Tallis had to raise the money at its own funding cost, say five per cent, which is five hundred thousand dollars.
- So the posting costs Tallis one hundred and fifty thousand dollars a year.
- Receiving collateral gives the opposite benefit: Meridian pays the collateral rate but can put the cash to work in place of borrowing at its own funding cost.
- These figures are illustrative, but the direction is the exam point.

## 23 Rehypothecation and segregation

- Rehypothecation: secured party reuses the collateral
- Pledge needs a contractual right; title transfer: owns it
- If reused and the receiver fails: only an unsecured claim
- Segregation with a custodian protects the pledgor
- Mandatory IM for non-cleared derivatives is segregated

**IN THE LESSON**

- Rehypothecation means the secured party reuses received collateral for its own obligations.
- Under a pledge based agreement it needs a contractual right to do so.
- Under a title transfer agreement the recipient owns the assets and may use them.
- The risk is that if collateral has been reused, and the recipient fails, the pledgor has only an unsecured claim for equivalent assets.
- Segregation, holding collateral with a third party custodian, protects the pledgor, but it removes the reuse and funding benefit.
- So there is a trade off between safety for the poster and cheap funding for the receiver.
- Mandatory initial margin for non cleared derivatives must be segregated.

## 24 Collateral swaps credit risk for other risks

*Market, operational and liquidity; funding is the cash form*

| Risk | How collateral creates it |
|---|---|
| Market | Collateral falls in value or currency |
| Operational | Calls, valuation, settlement, disputes |
| Liquidity | Cash demanded at short notice |
| Funding liquidity | Cash needed, hedged gain not cash |

IN THE LESSON

- Collateralization swaps credit risk for other risks.
- Market risk comes first: collateral securities can fall in value, or sit in a different currency, so a cushion of haircuts is needed, and on default the secured party faces price moves while it sells.
- Operational risk follows.
- Margin calls, valuation, settlement, disputes, tracking of reuse and legal documentation all depend on people, systems and data, and errors create exposure or failed transfers.
- Third is liquidity risk.
- Variation margin calls demand cash or high quality assets quickly, often when markets are stressed.
- That is funding liquidity risk.
- The point to remember is that collateral reduces credit risk at a cost elsewhere.

## 25 Example 6: a liquidity squeeze

*Swap hedges a bond. Rates move. Zero threshold. $ millions*

| | | |
|---|---|---|
| **Swap loss: variation margin** | Cash called within a day | **8.0** |
| **Gain on hedged bond** | Unrealised: no cash | **0** |
| **Rating trigger adds** | Downgrade call | **2.0** |
| **Cash needed quickly** | 8.0 + 2.0 | **10.0** |

IN THE LESSON

- Here is the liquidity risk in numbers.
- Tallis uses a swap to hedge a bond position.
- Rates move and the swap loses eight million dollars.
- Meridian calls variation margin, and Tallis must deliver eight million dollars in cash within a day.
- But the offsetting gain on the hedged bond is not yet realised, so no cash comes in.
- That is the funding liquidity risk: the hedger pays out cash while the matching gain is only on paper.
- Then a rating trigger fires and demands two million more.
- Tallis may have to sell assets in a falling market, which pushes prices down and strengthens the trigger.
- Rating triggered calls and forced sales can reinforce each other in a liquidity spiral.

## 26 SA-CCR: exposure at default and capital

**EAD = α × ( RC + PFE )**
**Capital = EAD × RW × 8%**

| | |
|---|---|
| **Alpha, fixed at 1.4** | Fixed by regulation |
| **Replacement cost, RC** | Loss if default were today |
| **Potential future exposure** | What could be added later |
| **Risk weight, RW** | Set by counterparty type |

IN THE LESSON

- Now the regulators.
- Under Basel Three, counterparty credit exposure is measured with S A C C R, the standardised approach.
- Exposure at default is alpha times the sum of replacement cost, R C, and potential future exposure, P F E.
- Replacement cost is the loss if the counterparty defaulted today.
- Potential future exposure is what could be added later.
- Alpha is fixed at one point four.
- Capital then follows the usual chain: exposure at default times the risk weight, R W, times the minimum capital ratio of eight per cent on risk weighted assets.
- Know both lines.
- There is also a separate capital charge for C V A, the credit valuation adjustment.

## 27 SA-CCR replacement cost for margined trades

**RC = max( V − C , TH + MTA − NICA , 0 )**

| | |
|---|---|
| **Contract value, V** | Value of the netting set |
| **Collateral held, C** | Collateral held today |
| **TH + MTA − NICA** | Unsecured amount that can persist |
| **Net independent collateral** | Independent collateral, net |

IN THE LESSON

- For a margined netting set, the replacement cost has two parts.
- V is the contract value of the netting set, C the collateral held, T H the threshold, and N I C A the net independent collateral amount.
- Replacement cost is the larger of three numbers.
- The first is V minus C, which is the exposure after collateral today.
- The second is threshold plus minimum transfer amount minus net independent collateral, and it recognises that unsecured exposure can persist even when collateral is perfectly up to date, because the threshold and the minimum transfer amount allow it.
- The third is zero.
- This second term is why the threshold plus the M T A matters so much.

## 28 Example 7: SA-CCR for Meridian and Tallis

*V 9.0, C 5.0, TH 3.0, MTA 0.5, NICA 1.0, PFE 2.0, RW 50%. $ millions*

| | | |
|---|---|---|
| **Replacement cost** | max(9 − 5, 3 + 0.5 − 1, 0) | **4.0** |
| **If V were only 5.5** | max(0.5, 2.5, 0) | **2.5** |
| **Exposure at default** | 1.4 × (4.0 + 2.0) | **8.4** |
| **Capital** | 8.4 × 50% × 8% | **$336,000** |

IN THE LESSON

- Take the netting set with Tallis.
- Its value V is nine million dollars and collateral held C is five million.
- The threshold is three million, the minimum transfer amount half a million, and net independent collateral one million.
- The first term is nine minus five, which is four.
- The second is three plus half minus one, which is two point five.
- Replacement cost is the larger, four million.
- If V were only five and a half, the first term would fall to point five, and the second would win at two point five: unsecured exposure persists.
- With potential future exposure of two million, exposure at default is one point four times six, or eight point four million.
- At a fifty per cent risk weight, capital is eight point four times fifty per cent times eight per cent, which is three hundred and thirty six thousand dollars.

## 29 The comprehensive approach

**NE = max( 0 , E × (1 + He) − C × (1 − Hc − Hfx) )**

| | |
|---|---|
| **Exposure, E** | Amount lent or exposure |
| **Haircut on exposure, He** | Gross-up for exposure |
| **Collateral, C** | Market value of collateral |
| **Haircut on collateral, Hc** | Cut for collateral's volatility |
| **FX haircut, Hfx** | Extra cut if currency differs |

IN THE LESSON

- A second formula covers collateral in the comprehensive approach, used for example for secured lending and repo.
- Here E is the exposure and C the collateral value, and the H terms are haircuts.
- The exposure is grossed up by its own haircut, because the amount owed may grow.
- The collateral is cut by its haircut, and by an extra foreign exchange haircut if its currency differs.
- What remains is the net exposure, N E, after haircuts, never below zero.
- So the same idea of haircut that protects the margin call also protects the capital calculation, but this time it makes the exposure bigger and the collateral smaller.

## 30 Example 8: net exposure after haircuts

*E 10.0, C 11.0, He 2%, Hc 4%, Hfx 8%. $ millions*

| | | |
|---|---|---|
| **Exposure grossed up** | 10.0 × (1 + 2%) | **10.20** |
| **Collateral after haircuts** | 11.0 × (1 − 4% − 8%) | **9.68** |
| **Net exposure** | max(0, 10.20 − 9.68) | **0.52** |
| **Ignoring haircuts** | max(0, 10.0 − 11.0) | **0** |

IN THE LESSON

- Suppose Meridian lends ten million dollars secured on eleven million dollars of bonds in a different currency.
- The haircut on the exposure is two per cent, the haircut on the bonds four per cent, and the extra foreign exchange haircut eight per cent.
- The exposure grows to ten point two million, ten times one point oh two.
- The bonds count for eleven times the quantity one minus point oh four minus point oh eight, which is eleven times point eight eight, or nine point six eight million.
- Net exposure is ten point two minus nine point six eight, which is point five two million.
- Ignoring the haircuts would have shown the loan as over-collateralised, with a net exposure of zero.
- The haircuts reveal a real remaining exposure.

## 31 Margin rules for non-cleared derivatives

- VM and IM required on non-cleared derivatives
- Between covered entities (BCBS-IOSCO rules)
- IM: 99% one-tailed, 10-day stress
- IM is segregated
- Separate CVA capital charge; EAD = 1.4 × (RC + PFE)

IN THE LESSON

- The last regulatory piece is margin itself.
- The B C B S and I O S C O rules, set by the Basel Committee on Banking Supervision and the International Organization of Securities Commissions, require variation margin and initial margin on non cleared derivatives between covered entities.
- Variation margin follows the changing value of the trades.
- Initial margin is calibrated to a ninety nine per cent one tailed, ten day stress, meaning it should cover the loss that is exceeded only one time in a hundred over a ten day closing out period.
- It must also be segregated.
- For the exam, know the formulas for exposure at default, replacement cost and net exposure, and know the ninety nine per cent and ten day parameters.

## 32 Recap: the main ideas

- Collateral cuts exposure, LGD, CVA, capital; not to zero
- Required = exposure + IA − threshold; haircut, MTA, round
- Agent calculates and calls; pay the undisputed part
- Risks swapped: funding, market, operational, liquidity
- EAD = 1.4 × (RC + PFE); IM at 99%, 10-day

IN THE LESSON

- Let us pull it together.
- Collateral is managed because it cuts exposure, loss given default, C V A and capital, but it reduces and transforms risk rather than removing it.
- A Credit Support Annex sets the threshold, minimum transfer amount, rounding, haircuts and independent amount.
- The margin call is required collateral, exposure plus independent amount minus threshold, less collateral held after haircuts, then the minimum transfer amount test, then rounding.
- The valuation agent calculates and calls, disputes are met by paying the undisputed part, and one way or two way decides who posts.
- Collateral creates funding, market, operational and liquidity risk, and regulators set capital with S A C C R, haircuts and the ninety nine per cent, ten day margin rule.

## 33 Try three quick questions

1. Exp 5.82, IA 0.5, TH 2.0, cash held 3.0, MTA 0.25, rounding 0.1. Call?
   **Answer:** Required 4.32; gap 1.32 ≥ MTA; rounded up: $1.4m.
2. SA-CCR: RC $3.0m, PFE $1.0m. Exposure at default?
   **Answer:** 1.4 × (3.0 + 1.0) = $5.6m.
3. A party disputes part of a call. May it withhold all of it?
   **Answer:** No. Pay the undisputed part now; resolve the rest.

**IN THE LESSON**

- Now try three quick questions.
- Pause the video, think, then listen to the answers.
- Question one.
- Exposure is five point eight two million dollars, the independent amount half a million, the threshold two million, and collateral already held three million in cash.
- The minimum transfer amount is a quarter million and rounding is to a hundred thousand.
- What is the call?
- Required is four point three two, the shortfall one point three two, above the minimum, rounded up to one point four million.
- Question two.
- Replacement cost is three million and potential future exposure one million.
- What is exposure at default?
- One point four times four million is five point six million.
- Question three.
- A party disputes part of a call.
- May it withhold the whole amount?
- No, it must pay the undisputed part at once.