Central Clearing

FRM Part I

1 A story: who pays if your partner fails?

- OTC derivatives: private deals between two firms
- Counterparty risk: the other side cannot perform
- A web of such deals lets one failure spread
- Idea: put one strong hub in the middle of every deal

IN THE LESSON

- Imagine a baker who agrees in March to buy flour from a miller at a fixed price, for delivery months later.
- Prices move.
- If flour becomes dear, the baker holds a valuable promise, but only if the miller is still in business to keep it.
- That worry is counterparty risk.
- Now picture a whole market of private deals, called over the counter derivatives, or O T C derivatives, where every firm has promises with many others.
- If one firm fails, the firms it owed money to may be hurt next, and the damage travels along the web.
- So market builders and regulators asked a simple question.
- What if every deal ran through one strong hub, rather than through hundreds of private links?
- That hub is the central counterparty.

2 Novation: the CCP steps in

- Novation: the original contract is cancelled
- Replaced by two contracts, each with the CCP
- CCP: buyer to every seller, seller to every buyer
- Matched book: no net market position if all perform

IN THE LESSON

- A central counterparty is a legal entity that steps between the two sides of a trade.
- The tool it uses is called novation.
- Suppose firm A and firm B agree a trade.
- Once it is accepted for clearing, that original contract is cancelled and replaced by two new ones: one between A and the C C P, the other between the C C P and B.
- So the C C P becomes the buyer to every seller and the seller to every buyer.
- Because the two legs offset each other, its book is matched.
- While every member performs, the C C P carries no net market position, no bet that prices will rise or fall.
- What it does carry is a promise to each side, and that promise is where its risk lies.

3 Example 1: novation of one trade

Illustration: A sells a 10m contract to B, cleared through a CCP

Before clearing	A and B face each other	**1 contract**
After novation	A ↔ CCP and CCP ↔ B	**2 contracts**
CCP: long and short	10m − 10m	**0 net**
If B defaults	B's loss goes to waterfall	**A still paid**

IN THE LESSON

- Let's follow one trade, with made up numbers.
- Firm A agrees to sell a ten million contract to firm B.
- Before clearing, A and B face each other directly: one contract.
- After novation, A faces the C C P and the C C P faces B: two contracts.
- Now look at the C C P's own position.
- It is on one side of ten million with A, and on the opposite side of ten million with B, so the net is zero.
- Last, suppose B defaults.
- The C C P must still honor its promise to A, and it meets the loss from its default waterfall, which we study next.
- A is paid, because the C C P stands in the middle of the trade.

4 Members and the layers of protection

- Only clearing members face the CCP directly
- Members meet capital and operational standards
- Variation margin daily; initial margin sized to loss
- Default order: defaulter's margin, then its fund share
- Then CCP capital, then survivors' fund shares

IN THE LESSON

- Not everyone can face the C C P.
- Only clearing members do, firms that meet capital and operational standards.
- Everyone else reaches the C C P through a member, a point we return to at the end.
- Now, how does the C C P protect itself?
- It has layers.
- Daily variation margin settles gains and losses every day, so exposure stays small.
- Initial margin is sized to the potential loss if a member fails.
- Then there is a default fund, a pool that members pay into and share, which we call mutualized, and finally the C C P's own capital.
- When a member does default, the loss is met in a set order.
- First the defaulter's initial margin, then the defaulter's own share of the default fund, then the C C P's own capital, and last the surviving members' shares.
- The next example shows that order.

5 Example 2: the default waterfall

Illustration: loss 90m. Defaulter's margin 50m, fund share 20m, CCP capital 10m

Defaulter's initial margin	90 − 50	**40 left**
Defaulter's fund share	40 − 20	**20 left**
CCP's own capital	20 − 10	**10 left**
Survivors' fund shares	10 − 10	**0 left**

IN THE LESSON

- Let's follow the order of losses.
- A member defaults and the loss is ninety million.
- The defaulter's own initial margin is fifty million, and it goes first: ninety minus fifty leaves forty.
- Next comes the defaulter's contribution to the default fund, twenty million: forty minus twenty leaves twenty.
- Third is the C C P's own capital, ten million: twenty minus ten leaves ten.
- Only now are surviving members' contributions touched, from a much larger pool, and ten covers the last of it, leaving zero.
- Notice the logic.
- The defaulter pays first, and the C C P's own capital sits before the survivors' money, so the C C P has its own skin in the game.
- A smaller loss would stop higher up the list, and survivors would lose nothing.

6 What a CCP does: four jobs

- Novate: the CCP faces each member
- Guarantee: margin plus a default fund
- Net: offset positions across members
- Default management: one process, often an auction

IN THE LESSON

- A C C P does four jobs.
- First, it novates trades, so that it faces each member and the members no longer face each other.
- Second, it guarantees performance.
- It does this by collecting margin and holding the default fund, so that a promise to pay is backed by real resources.
- Third, it nets positions across its members.
- We study netting in detail later in the lesson.
- Fourth, it runs a single default management process, usually an auction of the defaulter's book of trades, so that one orderly procedure replaces many separate scrambles.
- Keep these four jobs in mind, because the rest of the lesson builds on them.
- Each one connects to a feature of the rulebook that every member accepts on joining.

7 Bilateral clearing against central clearing

Same trades, two ways to clear them

	Bilateral | Central
Exposure	Many pairs | One CCP
Collateral terms	Own annex | Uniform rules
Credit monitoring	Each firm | CCP rules
Default close-out	Alone | One process
Suits	Bespoke | Standard, liquid

IN THE LESSON

- Now compare the two ways of clearing.
- In bilateral clearing, each pair of firms faces each other directly.
- Under central clearing, each firm has one exposure, to the C C P.
- On collateral, bilateral firms negotiate their own terms in a credit support annex, the part of the contract that sets collateral, under a master agreement.
- Central clearing uses uniform rules for everyone.
- On credit quality, bilateral firms must monitor each counterparty themselves, while a C C P relies on membership standards and margin.
- After a default, a bilateral firm closes out its own trades alone, but a C C P runs one process for all.
- Finally, central clearing works only for standardized, reasonably liquid contracts.
- Bespoke trades stay bilateral.
- And remember that clearing moves counterparty risk to the C C P.
- It does not remove it.

8 The benefits of central clearing

- Lower, more transparent counterparty risk
- Multilateral netting of exposures
- Daily collateral on mark to market moves
- Orderly, coordinated default management
- Less chance one failure spreads through the web

IN THE LESSON

- What do we gain from central clearing?
- The first benefit is lower and more transparent counterparty risk: instead of guessing at many firms, you look at one C C P with published rules.
- The second is multilateral netting of exposures, which shrinks the amounts at risk.
- The third is daily collateralization of mark to market moves, meaning changes in today's value of the positions, so that losses do not build up unseen.
- The fourth is orderly and coordinated default management, where a plan exists before anyone fails.
- The fifth is a lower chance that one failure spreads through a web of bilateral links, because fewer links exist to carry the shock.
- Taken together, the central theme is less contagion.
- Now we need the other side of the ledger.

9 The costs of central clearing

- Risk concentrates in a few CCPs, which are systemic
- Loss sharing weakens policing: moral hazard
- Margin and fund need liquid collateral
- Netting fragments across CCPs and uncleared trades
- Margin rises with volatility: procyclical

IN THE LESSON

- The costs come in five kinds.
- First, risk becomes concentrated in a few C C Ps, and the failure of one would be systemic.
- Second, because losses are mutualized, members have less reason to police each other.
- That weaker incentive is called moral hazard.
- Third, margin and default fund contributions must be funded with liquid collateral, which firms have to find and hold.
- Fourth, netting can be fragmented, spread across several C C Ps or split between cleared and uncleared trades.
- Fifth, margin rises when volatility rises.
- That is procyclical, meaning it makes stress worse just when firms are weakest.
- These costs are real, and a good answer weighs them against the benefits rather than simply listing them.

10 Each cost has a mirror-image benefit

Weigh the costs against their mirror images

Cost	Mirror-image benefit
Concentrated in few CCPs	Fewer links, less contagion
Loss mutualization	Shared losses, no single hit
Liquid collateral needed	Daily, covered exposure
Margin rises in stress	Margin tracks the risk
Netting fragmented	Wider netting in one CCP

IN THE LESSON

- Here is the key to comparing them: each cost has a mirror image benefit.
- Concentration in a few C C Ps is the flip side of fewer links, and so less contagion.
- Loss mutualization weakens policing, but it also means a single member's failure is shared and does not hit one firm alone.
- The need for liquid collateral is the price of daily, covered exposure.
- Margin that rises in stress is also margin that tracks the risk actually present.
- And netting can fragment across C C Ps, yet within one C C P it is wider than anything bilateral.
- So compare, do not just list.
- The main trade off is lower contagion against greater concentration and a heavier demand for liquidity.

11 Regulation after the 2008 crisis

- 2009 G20, Pittsburgh: clear standardized OTC deals
- Trade on exchanges or platforms; report to repositories
- Uncleared contracts: higher capital requirements
- Laws followed: Dodd-Frank (U.S.), EMIR (E.U.)

IN THE LESSON

- The crisis of two thousand eight showed how dangerous the web of private derivative deals could be.
- In two thousand nine the leaders of the G twenty, meeting in Pittsburgh, agreed three things.
- Standardized O T C derivatives should be cleared through C C Ps.
- They should be traded on exchanges or electronic platforms where appropriate.
- And they should be reported to trade repositories, which are central databases of trades.
- Contracts left uncleared should carry higher capital requirements, so that staying private costs more.
- National laws followed.
- The best known are the Dodd Frank Act in the United States and E M I R in the European Union.
- Notice the pattern: the push is toward clearing for standardized trades, and a heavier cost for everything left bilateral.

12 Initiatives and what they mean for clearing

Four initiatives and one distinction

Initiative	What it does
G20 Pittsburgh, 2009	Clear, trade, report
Dodd-Frank and EMIR	National laws, U.S. and E.U.
Basel III	Dearer capital if uncleared
BCBS-IOSCO framework	Initial and variation margin
Reporting against clearing	All reported; eligible cleared

IN THE LESSON

- Let's put the initiatives in a table.
- The G twenty agreement in Pittsburgh in two thousand nine set the three aims: clear, trade and report.
- Dodd Frank and E M I R turned those aims into national and regional law.
- Basel Three added capital charges that make uncleared trades dearer than trades with a qualifying C C P.
- The B C B S I O S C O framework requires initial and variation margin on uncleared derivatives between covered entities.
- Finally, a useful distinction.
- Reporting applies to all O T C derivatives, but the clearing obligation covers only eligible standardized ones.
- The result is that regulation pushes standardized trades into clearing, and makes the remaining bilateral trades more costly, through margin and capital.

13 Two kinds of margin

- Margin protects against loss after a default
- Variation margin: paid daily as value changes
- It resets current exposure to roughly zero
- Initial margin: covers loss during close out
- Margin period of risk: days needed to close out

IN THE LESSON

- Margin protects against the loss that follows a default.
- There are two kinds, and they do different jobs.
- Variation margin is paid daily, to reflect the change in the mark to market value of the positions.
- Because it is settled every day, current exposure is reset to roughly zero.
- But a default is not closed out in an instant.
- It takes some days to hedge or sell the defaulter's portfolio, and prices can move in that window, called the margin period of risk.
- Initial margin covers that potential loss.
- So variation margin deals with what has already happened, while initial margin deals with what could happen while the portfolio is being closed out.
- Both are needed, and now we size the second.

14 Sizing initial margin

IM = z × σ × V × √h

z	Confidence multiplier
sigma	Daily volatility
V	Portfolio value
h	Horizon in days, under a root
IM	Margin held against close out

IN THE LESSON

- Initial margin is a high confidence quantile of the change in portfolio value over the margin period of risk.
- The formula is simple.
- Initial margin, written I M, equals the confidence multiplier, called zee, times the daily volatility, called sigma, times the portfolio value, called vee, times the square root of the horizon in days, called aitch.
- The multiplier reflects how sure you want to be: a higher confidence level means a larger multiplier.
- Daily volatility times portfolio value is a typical daily move in money.
- The horizon is the number of days needed to close out, which is where the margin comes from.
- The key point is the square root.
- Risk over several days does not grow in proportion to the number of days, but with the square root of the number of days.
- Remember that, because it is the trap in this topic.

15 Example 3: initial margin over five days

Illustration: 100m portfolio, daily volatility 1%, z = 2.33, five days

Daily move in money	1% × 100m	**1.00m**
Square root of five days	√5	**2.236**
Initial margin	2.33 × 1.00m × 2.236	**5.21m**
Share of the portfolio	5.21m ÷ 100m	**5.21%**

IN THE LESSON

- Let's size a margin, with made up numbers.
- A portfolio is worth one hundred million.
- Its daily volatility is one per cent, and the multiplier is two point three three, roughly a ninety nine per cent one sided level.
- The horizon is five days, as for cleared swaps.
- First, the daily move in money: one per cent of one hundred million is one million.
- Second, the square root of five days is two point two three six.
- Third, multiply: two point three three, times one million, times two point two three six, gives five point two one million.
- Finally, as a share of the portfolio, five point two one million over one hundred million is five point two one per cent.
- That is the cushion the C C P holds against close out.

16 Example 4: ten days, and the linear trap

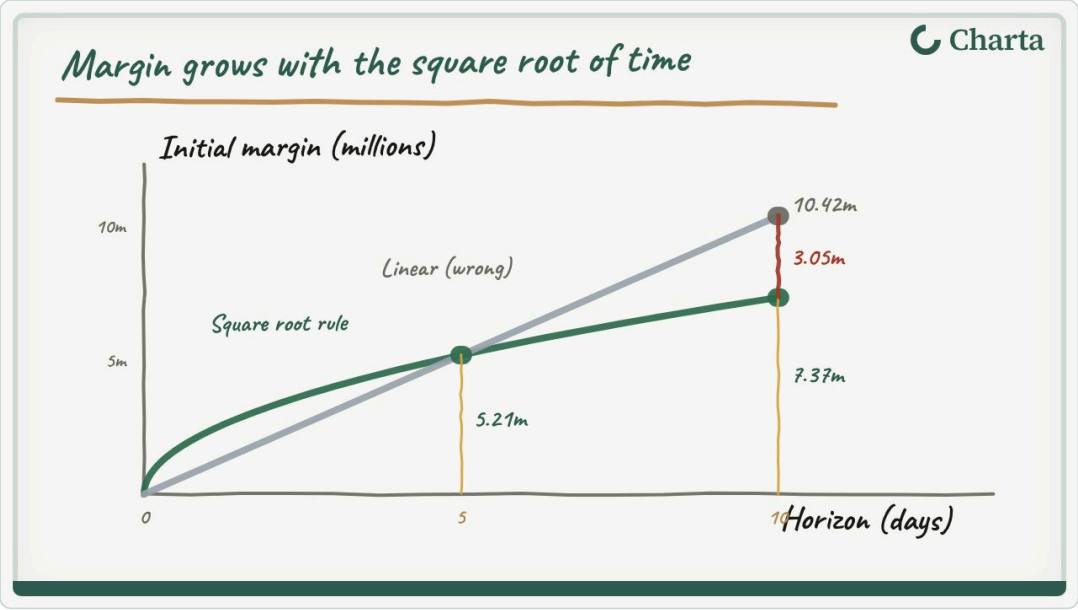
Same portfolio. Uncleared margin rules use a ten day horizon

Ten day margin	2.33 × 1.00m × √10	**7.37m**
Ratio to five days	7.37m ÷ 5.21m	**1.41**
Wrong: scale linearly	2 × 5.21m	**10.42m**
Overstatement	10.42m − 7.37m	**3.05m**

IN THE LESSON

- Now the same portfolio under the bilateral rules, which use a ten day horizon.
- Multiply two point three three, times one million, times the square root of ten, which is three point one six two, and the margin is seven point three seven million.
- How does it compare with five days?
- The ratio of seven point three seven to five point two one is one point four one, which is the square root of two, because ten days is twice five.
- Now the trap.
- Someone who scales linearly doubles five point two one, and gets ten point four two million.
- That overstates the margin by three point zero five million.
- Horizon scaling is by the square root of time, not linear.
- Doubling the horizon raises the margin by about forty one per cent.

17 Margin grows with the square root of time



IN THE LESSON

- Here is the idea in a picture.
- Along the bottom is the horizon in days, from zero to ten.
- Up the side is initial margin in millions.
- The green curve is the correct margin, rising with the square root of the horizon.
- It climbs quickly at first and then flattens.
- At five days it reaches five point two one million, and at ten days seven point three seven million.
- The grey straight line is the wrong, linear rule: it starts from zero and doubles at ten days to ten point four two million.
- The gap between the line and the curve at ten days is the overstatement we found.
- A longer horizon always needs more margin, but each extra day adds less than the one before.

18 Example 5: daily variation margin

Illustration: value of a member's position changes each day, in millions

Day 1: value falls	member pays the CCP	**−3m**
Day 2: value rises	member receives	**+1m**
Day 3: value falls	member pays the CCP	**−2m**
Net after three days	−3 + 1 − 2	**−4m**

IN THE LESSON

- Now variation margin.
- Take a member whose position changes in value each day, in made up millions.
- On day one the value falls by three million, so the member pays three million to the C C P.
- On day two the value rises by one million, so the member receives one million.
- On day three the value falls by two million, so the member pays two.
- After three days the cumulative flow is minus three, plus one, minus two: a net payment of four million.
- The point is not the total but the habit.
- Each day the loss is paid in cash, so exposure is reset to roughly zero and never builds up.
- Weak bilateral collateral terms can let exposure grow unseen.

19 Margin: cleared against uncleared

Both margins, two sets of rules

Feature	Cleared | Uncleared
Terms	Uniform | Negotiated
Thresholds	None | Often, in the past
Direction	Both ways | Often one way
Horizon	5 days | 10 days
Initial margin	CCP holds | Segregated

IN THE LESSON

- Now compare the margin rules in the two worlds.
- A C C P applies both margins to every member, on uniform terms, with no negotiated thresholds.
- Bilateral margin was set by the credit support annex, and was historically often one way, or subject to thresholds, so that small exposures went uncovered.
- Under the uncleared margin rules, initial margin must now be posted, and it is segregated, held apart so that it is not lost in the other side's failure.
- On the horizon, the C C P uses a shorter one, for example five days for cleared swaps, while the uncleared rules use ten days.
- Both sets of rules aim for the same thing, enough margin to survive a close out.
- Remember that horizon scaling is by the square root.

20 Netting: offsetting what is owed

- Netting: offset what you owe against what you are owed
- Bilateral: one pair only, under a master agreement
- Close out netting must be legally enforceable
- At a CCP: multilateral, one net position per class
- Lost if split across CCPs, uncleared sets or accounts

IN THE LESSON

- Netting reduces exposure by offsetting what a party owes against what it is owed.
- In bilateral markets, netting is available only within one pair of counterparties, and only inside a master agreement whose close out netting is legally enforceable.
- So a dealer facing three counterparties works out three separate net amounts, and its exposure is the sum of the positive ones.
- At a C C P, netting is multilateral.
- All of a member's trades in a product class with the C C P collapse into one net position, so offsetting trades done with different counterparties cancel.
- The benefit can disappear if trades are split across several C C Ps, between cleared and uncleared sets, or between house and client accounts.

21 Example 6: bilateral against multilateral

Illustration: dealer D. Value of trades to D, in millions, with X, Y, Z

Net with X, Y and Z	+10, −4, +6	**3 nets**
Bilateral exposure	10 + 0 + 6	**16m**
Multilateral, one CCP	10 − 4 + 6	**12m**
Saving for the dealer	16m − 12m	**4m**

IN THE LESSON

- Here is a dealer with three counterparties, in made up millions.
- Its trades with X are worth plus ten to the dealer, with Y minus four, and with Z plus six.
- In bilateral clearing each pair nets on its own, giving three separate net amounts.
- The exposure counts only the positive ones.
- Ten plus zero plus six gives sixteen million, because the minus four owed to Y cannot be used against what X and Z owe.
- Through one C C P, all three collapse into a single position: ten minus four plus six equals twelve million.
- The saving is sixteen minus twelve, four million.
- Netting is only as good as its enforceability: if a court might not honor it, the benefit is in doubt.

22 Example 7: netting lost by splitting

Illustration: two offsetting 100m positions. 1% daily, z 2.33, five days

Both at one CCP	100m − 100m	**0 net**
Margin at one CCP	no net position	**0**
Split: each CCP sees	one 100m position	**100m each**
Margin at the two	2 × 5.21m	**10.42m**

IN THE LESSON

- Now a case where netting is lost.
- A member holds two offsetting positions, each one hundred million, in the same product.
- Use the same margin settings as before.
- If both positions sit at one C C P, they cancel: one hundred million minus one hundred million is zero net, so there is no net position to margin and the margin is zero.
- Now split them, one at each of two C C Ps.
- Each C C P sees a position of one hundred million, and each charges five point two one million.
- Two times five point two one is ten point four two million of margin for the same economic position.
- Fragmenting netting is a real cost of clearing.

23 What clearing means for markets

- Web of links becomes hub and spoke: less contagion
- Hub too important to fail: standards, recovery plans
- Stress margin calls drain liquidity: procyclical
- Mandates raise collateral demand; some stay bilateral
- Counterparty risk is transformed, not eliminated

IN THE LESSON

- Now step back and think about the whole market.
- Central clearing replaces a dense web of bilateral exposures with a hub and spoke structure.
- That lowers contagion between dealers, improves transparency and makes defaults easier to manage.
- But it creates new concerns.
- Risk is concentrated in a small number of C C Ps that are too important to fail, so supervisors insist on strict standards and on recovery and resolution plans.
- Margin requirements rise in stress, which is procyclical and drains liquidity when participants are weakest.
- Clearing mandates raise demand for high quality liquid collateral, and products that cannot be cleared stay bilateral.
- The deepest point is this: counterparty risk is transformed into liquidity and operational risk and concentrated in the C C P, not eliminated.

24 Example 8: margin in a volatility spike

Illustration: 100m portfolio, five days, z = 2.33

Calm: volatility 1%	2.33 × 1.00m × 2.236	**5.21m**
Stress: volatility 2%	2.33 × 2.00m × 2.236	**10.42m**
Extra margin called	10.42m − 5.21m	**5.21m**
Rise in the call	5.21m ÷ 5.21m	**100%**

IN THE LESSON

- To see procyclicality, return to our portfolio of one hundred million, with a five day horizon and a multiplier of two point three three.
- In calm markets the daily volatility is one per cent.
- The margin is two point three three, times one million, times two point two three six, which is five point two one million.
- Now stress arrives and the daily volatility doubles to two per cent.
- A daily move is two million, and the margin becomes two point three three, times two million, times two point two three six, which is ten point four two million.
- The extra margin called is ten point four two minus five point two one, five point two one million, a rise of one hundred per cent.
- That cash is demanded just when firms are under strain.

25 Risks a CCP faces, part one

- Credit: member fails, resources fall short
- Market: prices move while the book is auctioned
- Liquidity: must pay variation margin in cash at once
- Investment: loss on reinvested cash margin

IN THE LESSON

- A C C P faces several distinct risks.
- Let's take the first four.
- Credit risk is the chance that a member fails and its margin and default resources do not cover the loss.
- Market risk arises while the defaulter's portfolio is being hedged or auctioned and prices move against the C C P.
- Liquidity risk is the need to pay variation margin to the surviving members in cash immediately, even though the defaulter's collateral may be held in securities that take time to sell.
- Investment risk is loss on the cash margin that the C C P reinvests.

26 Risks a CCP faces, part two

- Operational: system failure, error, cyber attack
- Legal: doubt over netting, collateral, default rules
- Model: margin set too low by a poor model
- Wrong way: member's default tied to its own portfolio

IN THE LESSON

- Now the other four.
- Operational risk covers system failure, error and cyber attack: the machinery of clearing breaks, even if the money is sound.
- Legal risk covers uncertainty over netting, collateral and default rules, for instance whether a court would honor a close out.
- Model risk is margin set too low by a poor model, so that the cushion looks fine but is not.
- And wrong way risk occurs when a member's default is linked to losses on its own portfolio: the very event that makes the member fail is also the event that makes the portfolio lose money, so the loss is bigger than average at the worst moment.
- Eight risks in all.
- A C C P that ignores any one of them is not truly safe.

27 Match the scenario to the risk

Ask what actually fails

Scenario	Risk
Model sets margin too low	Model risk
Pays cash, holds bonds	Liquidity risk
Cyber attack halts systems	Operational risk
Doubt over netting rules	Legal risk
Default tied to own book	Wrong way risk

IN THE LESSON

- Here is a classification exercise.
- The method is to ask what actually fails.
- A model that sets margin too low is model risk, because the cushion is built on a poor estimate.
- A C C P that must pay variation margin in cash while holding bonds has a liquidity problem: the value is there, but not in cash.
- A cyber attack that halts systems is operational risk.
- Doubt over whether netting rules would hold in court is legal risk.
- And a member whose own portfolio loses money in the very event that makes it fail is wrong way risk.
- Try covering the right hand column and naming each risk before you read it.
- Always find what actually fails, then name the risk.

28 Clearing members and their clients

- Members: post margin, fund the default pool
- Members: further calls, auctions, liable for clients
- Clients: no contract with the CCP, no fund duty
- Clients: member default, segregation, omnibus losses

IN THE LESSON

- Finally, who bears which risks?
- Clearing members belong to the C C P.
- They post initial and variation margin to it, contribute to the default fund, and can be called for further assessments and obliged to join default auctions.
- They are also liable to the C C P for their clients' trades, so a client default beyond its margin falls on the member.
- Clients, the non members, clear through a member.
- They have no contract with the C C P and no default fund obligation.
- Their main risks are that the clearing member defaults, so positions must be ported, meaning moved, to another member, and that margin held at the member is not properly segregated.
- In an omnibus account, a further risk is that other customers' losses reduce the margin available.

29 Member risks against client risks

Same system, different exposures

	Member | Client
Posts margin	To CCP | Via member
Default fund	Pays in | No duty
Liable for	Clients' trades | Own trades
Main risk	Loss share | Member failure
Also exposed to	Auctions | Segregation

IN THE LESSON

- Let's put the two side by side.
- A member posts margin to the C C P itself, while a client posts it through the member.
- A member contributes to the default fund, and a client has no such obligation.
- A member is liable for its clients' trades as well as its own, while a client is liable only for its own.
- The main risk for a member is loss mutualization, the sharing of a defaulter's losses, together with the guarantee it gives for clients.
- The main risk for a client is the failure of its clearing member, and the way its margin is held.
- Members are also exposed to default auctions, clients to segregation.
- So members bear loss mutualization and client guarantee risk, while clients bear clearing member default and segregation risk.

30 Example 9: a client defaults beyond its margin

Illustration: client loses 14m, margin posted 10m, in millions

Loss on client's positions	client defaults	**14m**
Client's margin	held via the member	**10m**
Shortfall	14m − 10m	**4m**
Who pays	the clearing member	**4m**

IN THE LESSON

- Let's see the client guarantee at work, with made up millions.
- A client's positions lose fourteen million and the client defaults.
- The client had posted ten million of margin through its clearing member.
- The shortfall is fourteen minus ten, four million.
- Who pays?
- Not the client, which has failed, and not the C C P at first, because the member is liable to the C C P for its clients' trades.
- So the clearing member pays the four million.
- This is why members monitor their clients carefully and demand margin.
- Now the mirror case for the client.
- If the member itself defaulted, the client would depend on its positions being ported to another member, and on its margin having been properly segregated.
- Different party, different risk.

31 Four mistakes to avoid

- Believing risk vanishes: it moves to the CCP
- Scaling margin by time: use the square root
- Wrong waterfall: defaulter, CCP capital, survivors
- Netting not universal: fragments, needs enforceability

IN THE LESSON

- Mistake one: believing that clearing removes counterparty risk.
- It moves the risk to the C C P, and transforms it into liquidity and operational risk.
- Mistake two: scaling margin linearly with time.
- Margin grows with the square root of the horizon, so ten days is about one point four one times five days, not twice.
- Mistake three: getting the default waterfall in the wrong order.
- The defaulter pays first, then the C C P's own capital, and only then the survivors' money.
- Mistake four: assuming netting works everywhere.
- It is wider within one C C P, but it fragments across C C Ps, across cleared and uncleared sets and across house and client accounts, and it is worthless where enforceability is in doubt.

32 Recap: the main ideas

- Novation hub; four jobs; waterfall: defaulter first
- Gains: less contagion; netting wider but can fragment
- Costs: concentration, moral hazard, liquidity demand
- Since 2009, rules push standard trades into clearing
- IM: √h rule; variation daily; members, clients differ

IN THE LESSON

- Let's pull it together.
- A C C P novates trades and becomes the buyer to every seller and the seller to every buyer, protected by margin, a default fund and its own capital, used in a set order.
- It novates, guarantees, nets and manages defaults, which differs from bilateral clearing, and it works for standardized trades.
- Its benefits are lower contagion and wider netting, and its costs are concentration, moral hazard and liquidity demand.
- Regulation since two thousand nine pushes standardized trades into clearing.
- Initial margin follows a square root of time rule, and variation margin resets exposure daily.
- Netting is multilateral at a C C P but can fragment.
- Members and clients bear different risks.

33 Try three quick questions

1. Loss 65m; margin 50m; fund share 20m. Who pays what?
   Answer: Margin 50m, then 15m of the fund share. CCP capital and survivors pay nothing.
2. 40m portfolio, 1.5% daily, z 2.33, 5 days. Initial margin?
   Answer: 2.33 × 0.6m × √5 = 3.13m. The daily move is 1.5% × 40m = 0.6m.
3. Dealer owed 12m by A, owes 5m to B. Bilateral? One CCP?
   Answer: Bilateral: 12m. Through one CCP: 12 − 5 = 7m.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- A member defaults and the loss is sixty five million.
- Its initial margin is fifty million and its default fund share is twenty million.
- Who pays what?
- Question two.
- A portfolio is worth forty million, its daily volatility is one point five per cent, the multiplier is two point three three and the horizon is five days.
- What is the initial margin?
- Question three.
- A dealer is owed twelve million by one counterparty and owes five million to another.
- What is its exposure bilaterally, and what is the net position through one C C P?
- The answers are on the board.