CHARTA LEARNING · LESSON NOTES

Liquidity Stress Testing

FRM Part II

1 A story: the test that said all was well

- Kestrel's group report: plenty of cash in total
- A rumour started a run on the parent
- Much cash sat in the subsidiary; it could not leave
- Lumping liquidity together hid the problem

IN THE LESSON

- Imagine Kestrel Bank, a group with a parent bank at home and a subsidiary abroad.
- Its first liquidity stress test produced one comforting number: the group as a whole had plenty of cash.
- Then a rumour about the parent started a run on its funding.
- Much of the group's cash, though, sat in the subsidiary abroad, and the local regulator would not let it leave.
- The cash was real, but it was in the wrong place.
- Kestrel's test had lumped all liquidity together, and that hid where cash could actually come from and where it would go.
- The cure is to split liquidity risk into separate categories, and that is our first task.

2 Five kinds of liquidity

- Funding: raise cash or roll liabilities at acceptable cost
- Operational: cash and collateral to run the business daily
- Strategic: cash the firm chooses to spend for its franchise
- Contingent: needs that arise only if an event occurs
- Restricted: cash that exists but cannot be moved

IN THE LESSON

- Liquidity risk is not one thing.
- Here are the five categories, and each asks a different question.
- Funding liquidity: can the firm raise cash or roll its liabilities at an acceptable cost?
- Operational liquidity: does it have the cash and collateral to run the business day to day?
- Strategic liquidity: how much cash might it choose to spend, without being obliged to, to protect its franchise?
- Contingent liquidity: what needs arise only if some event occurs?
- And restricted liquidity: which cash and assets exist but cannot be moved to where they are needed?
- A stress test that keeps these apart shows where cash really comes from and where it goes.
- Let us take each in turn.

3 Funding liquidity

- Ability to raise cash or roll existing liabilities
- Liabilities: deposits and wholesale debt
- At an acceptable cost, not at any price
- Stress: depositors leave, lenders refuse to roll

IN THE LESSON

- Funding liquidity is the ability to raise cash, or to roll existing liabilities, at an acceptable cost.
- To roll a liability means to replace it when it matures, for example when a depositor leaves money in the bank, or a lender buys new debt as the old debt is repaid.
- Kestrel's liabilities are deposits from households and companies, and wholesale debt, which is borrowing from other financial institutions and professional investors.
- The words at an acceptable cost matter.
- A bank may still find a lender at a punishing price, but if the price is ruinous, it has lost its funding liquidity.
- In stress, depositors withdraw and wholesale lenders refuse to roll, so this is where most outflows start.

4 Operational liquidity

- Cash and collateral to run the business day to day
- Intraday payment and settlement flows
- Margin on derivatives and cleared trades
- Needed even in calm times; grows in stress

IN THE LESSON

- Operational liquidity is the cash and collateral a firm needs simply to run its business day to day.
- A bank makes payments for itself and its clients all through the day, and settles trades in securities, so it needs cash at the right moment within the day.
- This is called intraday liquidity, and it covers payment and settlement flows.
- The bank also posts margin, meaning cash or securities handed over as security on derivatives and cleared trades, and margin rises when markets move.
- None of this is optional.
- If Kestrel cannot make a payment on time, it can lose the trust of the market within hours.
- Operational needs exist in calm times, and they grow in stress.

5 Strategic liquidity

- Cash the firm chooses to spend, though not obliged to
- Purpose: protect its franchise
- Example: support an affiliated fund
- Example: buy back its own paper
- A stress test should include it as an outflow

IN THE LESSON

- Strategic liquidity is cash the firm chooses to spend, though it is not obliged to, in order to protect its franchise, meaning its business and its name with customers.
- Suppose a fund run by Kestrel's asset management arm is hit by redemptions.
- Kestrel has no contract requiring it to help, but clients would blame the Kestrel name if the fund failed, so Kestrel may support the affiliated fund with cash.
- Or suppose Kestrel's commercial paper, its short term unsecured debt, is falling in price.
- Kestrel may buy back its own paper to reassure the market.
- These outflows are voluntary, but they are very real in stress, so a good stress test includes them as outflows.

6 Contingent liquidity

- Needs that arise only if an event occurs
- Drawdowns on committed lines in stress
- Collateral calls triggered by a downgrade
- Also the source side: cash the firm can raise then

IN THE LESSON

- Contingent liquidity concerns flows that arise only if an event occurs.
- On the need side, think of committed lines.
- Kestrel has promised companies it will lend up to an agreed limit whenever they ask.
- In normal times they draw little.
- In stress they draw heavily, just when Kestrel is short of cash.
- Another example is a collateral call triggered by a downgrade.
- Many derivative contracts require a bank to post extra collateral if its credit rating falls, so one rating action can create a large outflow overnight.
- Contingent liquidity also has a source side: the cash a firm can generate if a stress event occurs.
- We will measure that side from the liquid asset buffer.

7 Restricted liquidity

- Cash or assets that exist but cannot be moved
- Legal entity: owned by a separate company
- Regulatory: a local regulator ring-fences it
- Tax and collateral constraints
- Trap: counting restricted cash as free at group level

IN THE LESSON

- Restricted liquidity is cash or assets that exist, but cannot be moved to where they are needed.
- A legal entity constraint arises because a subsidiary is a separate company, and its cash belongs to it.
- A regulatory constraint arises when a local regulator ring fences the subsidiary, meaning it requires the cash to stay inside the country to protect local depositors.
- Then there are tax and collateral constraints.
- Moving money across borders can trigger a tax charge, and an asset held as security by someone else cannot be used.
- The usual mistake is to count restricted cash as freely available at group level, which is exactly what happened in Kestrel's story.

8 Example 1: name the kind of liquidity

A stressed week at Kestrel: name the kind of liquidity in each flow

Depositors leave; debt not rolled	raising or rolling cash	**Funding**
Routine clearing house margin call	running the business	**Operational**
Buying back its own paper	chosen, not obliged	**Strategic**
Client draws a committed line	triggered by the event	**Contingent**
Surplus cash stuck in subsidiary	cannot be moved	**Restricted**

IN THE LESSON

- A stressed week at Kestrel: let us name the kind of liquidity in each flow.
- Depositors withdraw, and a lender refuses to roll its loan.
- That is about raising or rolling cash, so it is funding liquidity.
- A clearing house makes its routine call for more margin on Kestrel's derivatives.
- That is part of running the business, so it is operational, though a margin call triggered by a specific event, such as a downgrade, would count as contingent.
- Kestrel buys back its own paper to calm the market.
- It chose to do that and was not obliged to, so it is strategic.
- A corporate client draws its committed line.
- That need exists only because of the event, so it is contingent.
- And the surplus cash stuck in the subsidiary abroad cannot be moved, so it is restricted.
- On the exam, watch strategic against contingent: one is a choice, the other a trigger.

9 Example 2: cash in the wrong place

Parent needs $1,200m in 3 days. Cash: parent $1,230m, subsidiary $900m (ring-fenced)

Group cash, as reported	1,230 + 900	**$2,130m**
Subsidiary's own stress need	kept for local outflows	**$300m**
Lumped view: spare cash	2,130 − 300 − 1,200	**$630m**
Parent's own cash less its need	1,230 − 1,200	**$30m**
Trapped in the subsidiary	900 − 300, ring-fenced	**$600m**

IN THE LESSON

- The parent needs one thousand two hundred million dollars over the next three days.
- Its own cash is one thousand two hundred and thirty million, and the subsidiary holds nine hundred million, which is ring fenced.
- So the group report shows cash of two thousand one hundred and thirty million.
- The subsidiary keeps three hundred million for its own stressed outflows.
- The lumped view takes the group's two thousand one hundred and thirty, subtracts the subsidiary's three hundred and the parent's one thousand two hundred, and shows six hundred and thirty million to spare.
- The parent's own cash less its need is one thousand two hundred and thirty minus one thousand two hundred, only thirty million.
- The subsidiary's surplus of six hundred million is trapped.
- The real cushion is thirty million, not six hundred and thirty.

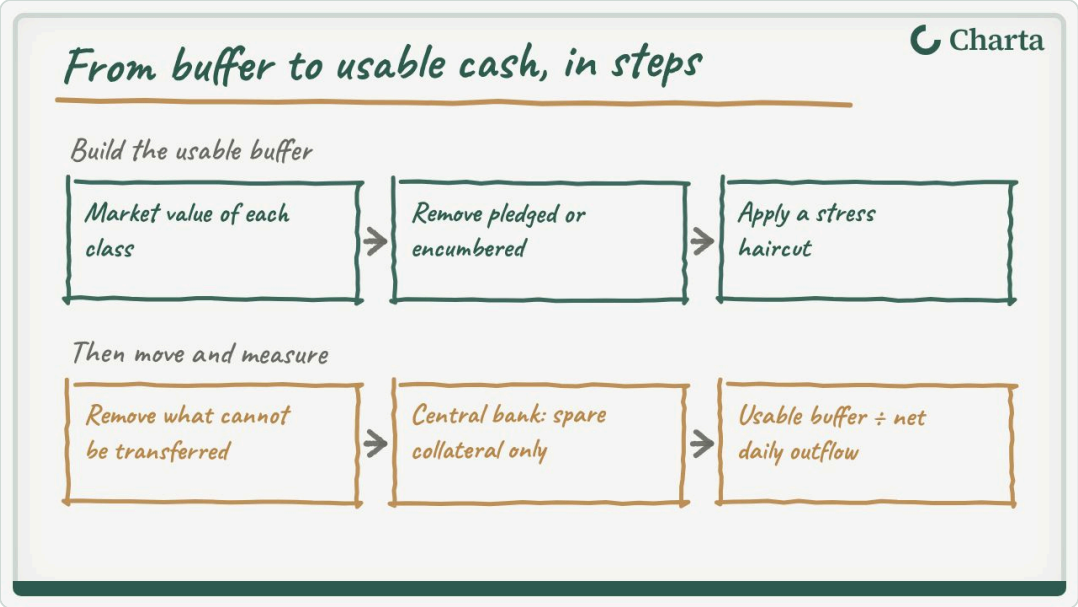
10 The liquid asset buffer

- Stock of unencumbered, high-quality assets
- Sold or repo'd quickly to raise cash in stress
- Unencumbered: not pledged or otherwise tied up
- Haircut: the cut from market value in a sale or repo
- Starting point for contingent liquidity

IN THE LESSON

- Now to the source side.
- The liquid asset buffer is the stock of unencumbered, high quality assets that a firm can sell, or repo, quickly to raise cash in stress.
- A repo, short for repurchase agreement, is a loan secured on securities: the bank hands over bonds, receives cash, and buys the bonds back later.
- Unencumbered means not already pledged or otherwise tied up, so the asset is free to use.
- A haircut is the cut from market value that a buyer or a repo lender applies, so a bond worth one hundred might raise only ninety eight.
- The buffer is the natural starting point for measuring contingent liquidity, meaning the cash a firm can generate if a stress event occurs.

11 From buffer to usable cash, in steps



IN THE LESSON

- The estimate works in steps.
- The top row builds the usable buffer.
- First, start with the market value of each asset class.
- Second, remove anything already pledged or otherwise encumbered.
- Third, apply a stress haircut, to reflect both price falls and increases in repo margins, which is the extra collateral lenders demand.
- The bottom row moves and measures.
- Fourth, remove assets that cannot be transferred to the legal entity that needs the cash.
- Then add counterbalancing sources, such as borrowing from the central bank, separately, and only on eligible collateral that remains, because one asset cannot be both sold and pledged.
- Last, divide the usable buffer, after haircuts and after removing what cannot move, by the net daily stress outflow, and you have the survival horizon, the number of days the firm can last.
- Central bank capacity gives a second, separate figure.

12 Example 3: market value less what is pledged

Kestrel's liquid assets, $m: market value less what is already pledged

Cash at central bank, parent	nothing pledged	**1,230**
Government bonds	4,000 − 1,000 in repo	**3,000**
Agency bonds	1,500 − 300 pledged	**1,200**
Investment-grade corporates	1,000 − 0	**1,000**
Subsidiary's surplus cash	900 − 300 own need	**600**

Unencumbered total 7,030. Pledged 1,300 left out

IN THE LESSON

- Here are Kestrel's liquid assets, in millions of dollars: market value less what is already pledged.
- Cash at the central bank, held by the parent, is one thousand two hundred and thirty, and none of it is pledged.
- Government bonds are worth four thousand, but one thousand are already lent out in repo, so three thousand remain.
- Agency bonds, issued by government sponsored agencies, are worth one thousand five hundred, with three hundred pledged, leaving one thousand two hundred.
- Investment grade corporate bonds are one thousand, all free.
- Finally, the subsidiary's surplus cash is six hundred: its nine hundred less its own need of three hundred.
- The unencumbered total is seven thousand and thirty million.
- Counting the pledged one thousand three hundred would be the first error.

13 Example 4: apply stress haircuts

Stress haircuts: cash 0%, government 2%, agency 10%, corporate 25%. Amounts in $m

Cash at the parent	1,230 × (1 − 0%)	**1,230**
Government bonds	3,000 × (1 − 2%)	**2,940**
Agency bonds	1,200 × (1 − 10%)	**1,080**
Corporate bonds	1,000 × (1 − 25%)	**750**
Subsidiary's surplus cash	600 × (1 − 0%)	**600**

Buffer after haircuts: 6,600

IN THE LESSON

- Kestrel's stress haircuts are zero for cash, two per cent for government bonds, ten per cent for agency bonds and twenty five per cent for corporate bonds.
- They reflect price falls and wider repo margins in stress, not calm market levels.
- Cash at the parent stays at one thousand two hundred and thirty.
- Government bonds give three thousand times ninety eight per cent, two thousand nine hundred and forty.
- Agency bonds give one thousand two hundred times ninety per cent, one thousand and eighty.
- Corporate bonds give one thousand times seventy five per cent, seven hundred and fifty.
- The subsidiary's cash stays at six hundred.
- The buffer after haircuts is six thousand six hundred million dollars.
- Haircuts that are too small for stress are the second common error.

14 Example 5: what can move, and the central bank

Remove what cannot move, then add the central bank on spare collateral ($m)

Buffer after haircuts	from the last step	**6,600**
Less trapped subsidiary cash	6,600 − 600	**6,000**
Central bank: spare eligible loans	2,000 × (1 − 30%)	**1,400**
Counterbalancing capacity	6,000 + 1,400	**7,400**
Wrong: pledge govt bonds again	7,400 + 2,940	**10,340**

IN THE LESSON

- Now remove what cannot move, then add the central bank on spare collateral.
- The buffer after haircuts is six thousand six hundred.
- The subsidiary's six hundred is ring fenced and cannot reach the parent, so the usable buffer is six thousand.
- Kestrel can also borrow from the central bank against eligible collateral.
- It has two thousand million of loans that the central bank accepts and that are not in the buffer.
- After a central bank haircut of thirty per cent, they raise one thousand four hundred.
- Total counterbalancing capacity is seven thousand four hundred.
- The wrong answer pledges the government bonds to the central bank as well, adding another two thousand nine hundred and forty, for ten thousand three hundred and forty.
- But those bonds were already counted as sold.
- That is double counting collateral.

15 Example 6: the net daily stress outflow

Name-specific stress over 30 days: outflows by counterparty type, $m

Retail deposits	30,000 × 10%	**3,000**
Corporate deposits	8,000 × 30%	**2,400**
Maturing wholesale debt, no roll	6,000 × 100%	**6,000**
Committed lines drawn	10,000 × 20%	**2,000**
Net daily outflow	(13,400 − 1,400) ÷ 30	**400**

IN THE LESSON

- Next, the outflow side, in a name specific stress over thirty days.
- Kestrel applies run off rates by counterparty type, where a run off rate is the share of a balance assumed to leave.
- Retail deposits of thirty thousand million lose ten per cent, three thousand.
- Corporate deposits of eight thousand lose thirty per cent, two thousand four hundred.
- Maturing wholesale debt of six thousand is not rolled at all, so all six thousand leaves.
- Of ten thousand in committed lines, twenty per cent is drawn, two thousand.
- Gross outflows total thirteen thousand four hundred.
- Kestrel still expects one thousand four hundred of inflows, mostly from loans repaid, so net outflows are twelve thousand over thirty days: four hundred million a day.
- Three days of that is the one thousand two hundred million of our second example.

16 The usable buffer and the survival horizon

Usable buffer = Σ transferable (MV − encumbered) × (1 − haircut)
Survival horizon = usable buffer ÷ net daily outflow

Market value	Market value of each class
Encumbered amount	Already pledged or tied up
Stress haircut	Covers price falls, repo margins
Survival horizon	Days the firm can last
Net daily stress outflow	Outflows less inflows, per day

IN THE LESSON

- Here are the two formulas.
- The usable buffer is a sum over the transferable asset classes, meaning those that can reach the entity needing the cash.
- For each class, take the market value, written M V, less the encumbered amount, meaning whatever is already pledged or tied up, and multiply by one minus the stress haircut, which covers price falls and wider repo margins.
- The survival horizon, the number of days the firm can last, is the usable buffer divided by the net daily stress outflow, which is outflows less inflows, per day.
- One caution: this assumes outflows are spread evenly, so a lumpy day early on can bite sooner.
- And central bank borrowing stays on a separate line, added only on spare collateral.

17 Example 7: Kestrel's survival horizon

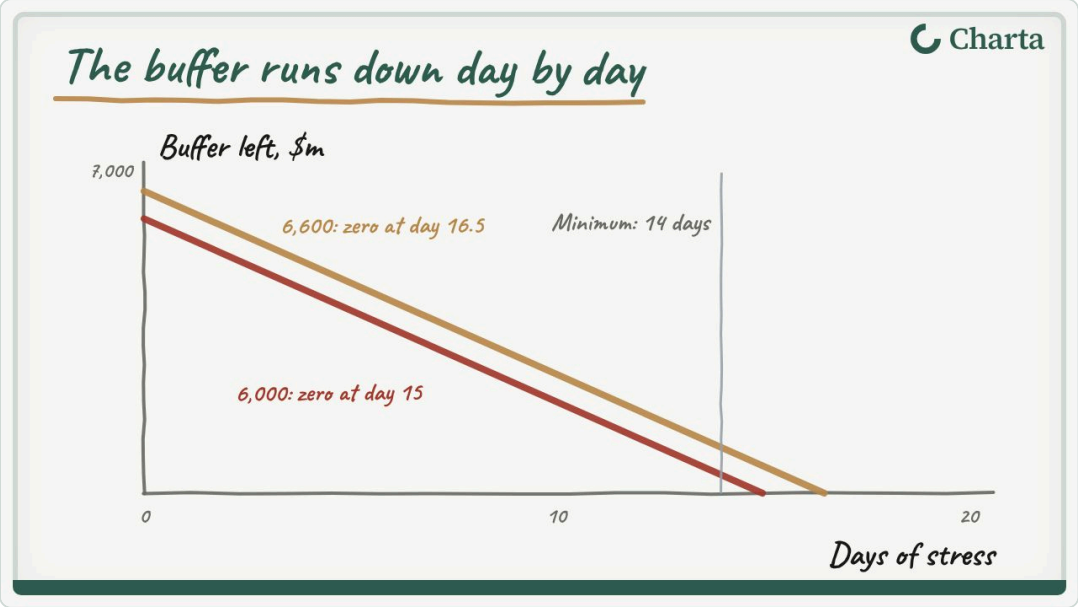
Usable buffer $6,000m; with central bank $7,400m; net outflow $400m a day

Survival horizon	6,000 ÷ 400	**15 days**
Board's minimum	Kestrel's own limit	**14 days**
With the central bank	7,400 ÷ 400	**18.5 days**
Wrong: trapped cash counted	6,600 ÷ 400	**16.5 days**

IN THE LESSON

- The usable buffer is six thousand million dollars, capacity including the central bank is seven thousand four hundred, and net outflow is four hundred a day.
- The survival horizon is six thousand divided by four hundred, fifteen days.
- Kestrel's board has set its own minimum of fourteen days, so the test passes, with one day to spare.
- Adding the central bank facility gives seven thousand four hundred divided by four hundred, eighteen and a half days.
- That is a useful second line, but Kestrel reports it separately because it depends on spare eligible collateral.
- If the trapped subsidiary cash had been counted, the figure would be six thousand six hundred over four hundred, sixteen and a half days, which flatters the truth.

18 The buffer runs down day by day



IN THE LESSON

- Here is the picture.
- Along the bottom are days of stress, from zero to twenty, and up the side is Kestrel's buffer in millions of dollars, from zero to seven thousand.
- The red line starts at six thousand and falls by four hundred every day.
- It reaches zero at day fifteen, the survival horizon.
- The gold line starts at six thousand six hundred, because it wrongly includes the trapped subsidiary cash, and it reaches zero at sixteen and a half days.
- The grey vertical guide at day fourteen is the board's minimum.
- Notice how close the true line runs to the limit.
- A day and a half of false comfort can change a decision about whether to act, which is why each error in the buffer matters.

19 Usable in stress? Test it, do not assume it

- Encumbrance: is it really free today?
- Currency: is it in the currency needed?
- Haircuts that widen in stress
- Still eligible and marketable in stressed markets?
- Operational: can it be mobilised in time?

IN THE LESSON

- High quality alone does not guarantee cash, so usability in stress must be tested, not assumed.
- Check encumbrance: is the asset really free today, or was it pledged last week?
- Check currency: bonds in one currency do not pay outflows in another unless they can be swapped, which may be hard in stress.
- Check haircuts, which widen in stress as buyers and repo lenders grow cautious.
- Check continued eligibility and marketability: will the central bank still accept the asset, and will buyers still trade it, when markets are stressed?
- And check the operational ability to mobilise the assets in time, meaning the systems, accounts and staff to sell or repo them on the day they are needed.

20 Example 8: haircuts widen in market stress

Haircuts widen: government 2% to 3%, agency 10% to 20%, corporate 25% to 50% ($m)

Government bonds	3,000 × (3% − 2%)	**−30**
Agency bonds	1,200 × (20% − 10%)	**−120**
Corporate bonds	1,000 × (50% − 25%)	**−250**
Usable buffer	6,000 − 400	**5,600**
Survival horizon	5,600 ÷ 400	**14 days**

IN THE LESSON

- Now suppose the stress spreads to markets, and haircuts widen: government bonds from two to three per cent, agency bonds from ten to twenty, and corporate bonds from twenty five to fifty.
- The extra cut on government bonds is three thousand times one per cent, thirty million.
- On agency bonds it is one thousand two hundred times ten per cent, one hundred and twenty.
- On corporate bonds it is one thousand times twenty five per cent, two hundred and fifty.
- Together that is four hundred, so the usable buffer falls from six thousand to five thousand six hundred.
- Holding outflows fixed at four hundred a day, to isolate the haircut effect, the survival horizon falls to fourteen days, right at the board's minimum.
- The spare day has gone without a single extra dollar of outflow.

21 Common errors in the buffer estimate

- Counting encumbered assets as free
- Haircuts that are too small for stress
- Double counting: one asset both sold and pledged
- Counting restricted cash at group level
- Assuming quality means cash, without testing

IN THE LESSON

- Let us collect the errors.
- First, counting encumbered assets, as if bonds already lent in repo could be sold again.
- At Kestrel that would add one thousand three hundred million of market value that is not there.
- Second, haircuts that are too small for stress: when market stress widened them, four hundred million came off the buffer.
- Third, double counting collateral, treating one asset as both sold and pledged to the central bank.
- Fourth, counting restricted cash at group level, like the six hundred million trapped abroad.
- And fifth, assuming that a high quality asset means cash, without testing whether it can be used in time, in the right currency and in the right place.

22 A stress test is a set of design choices

- Scope: entities, currencies, products, horizons
- Scenarios: idiosyncratic, market-wide, combined
- Assumptions: run-off, drawdowns, haircuts, actions
- Outputs: cash flow profile, gaps by horizon, survival
- Governance, and fit with other risk models

IN THE LESSON

- So far we have used one set of numbers.
- But a liquidity stress test is a set of design choices, and each one changes the answer.
- Scope fixes which legal entities, currencies, products and time horizons are covered.
- Scenarios describe what goes wrong, usually an idiosyncratic shock, a market wide shock and a combined case.
- Assumptions set run off rates, drawdowns, haircuts and management actions.
- Outputs are the cash flow profile, the surplus or shortfall by horizon, and the survival horizon.
- Finally comes governance, meaning who approves, who challenges and what happens next, and the fit with the bank's other risk models.
- We take each choice in turn, with Kestrel as the example.

23 Scope: what the test covers

- Legal entities: each one, not only the group
- Currencies: each major currency separately
- Products: deposits, wholesale, derivatives, lines
- Horizons: overnight, a week, a month and longer
- So restricted liquidity is not hidden in a total

IN THE LESSON

- Scope fixes what the test covers.
- Legal entities: run the test for each significant entity, not only for the group, because cash cannot always move between them.
- Currencies: run it for each major currency separately, because a surplus in one currency does not pay a shortfall in another.
- Products: cover every source of flows, from deposits and wholesale funding to derivatives and committed lines.
- Horizons: look at several, from overnight to a week, a month and longer, because a bank can look fine over a month and still fail tomorrow.
- The purpose is that restricted liquidity in one entity is not hidden by a consolidated total.
- Kestrel's first test, run for the group only, failed on scope.

24 Scenario building: three cases

Combined case: market-based mitigants fail together

Scenario	Shock	What still helps
Idiosyncratic	Kestrel's name alone	Markets work: sell assets
Market-wide	All firms, all markets	Funding holds better; sales hard
Combined	Both at once	Mitigants fail: most severe

IN THE LESSON

- In the combined case, market based mitigants fail together.
- Let us see why.
- An idiosyncratic scenario is a shock to Kestrel's name alone, perhaps a rumour or a downgrade.
- Markets still work, so Kestrel can sell assets at fair prices.
- A market wide scenario hits all firms and all markets.
- Kestrel's own name is trusted, so its funding holds up better, but assets are hard to sell and haircuts widen.
- The combined case has both at once.
- Depositors and lenders flee Kestrel just as markets seize up, so the mitigants that rely on markets, such as selling bonds or raising repo funding, fail together.
- That is why the combined case is usually the most severe.

25 Example 9: Kestrel's three scenarios

Run-off rates and net daily outflow by scenario, 30 days, $m

Item	Idiosyncratic	Market-wide	Combined
Retail / corporate	10% / 30%	5% / 20%	15% / 40%
Wholesale not rolled	100%	80%	100%
Lines drawn	20%	30%	35%
Gross less inflows	13,400 − 1,400	10,900 − 400	17,200 − 400
Net per day (÷ 30)	400	350	560

IN THE LESSON

- Here are Kestrel's run off rates and net daily outflows by scenario, over thirty days, in millions of dollars.
- Retail and corporate deposits run off at ten and thirty per cent in the idiosyncratic case, at five and twenty in the market wide case, where Kestrel's name is trusted, and at fifteen and forty in the combined case.
- Wholesale debt is not rolled at all in the idiosyncratic case, eighty per cent is lost in the market wide case, and all of it in the combined case.
- Committed lines are drawn at twenty, thirty and thirty five per cent.
- Inflows fall from one thousand four hundred to four hundred when borrowers are stressed too.
- So gross outflows less inflows are thirteen thousand four hundred less one thousand four hundred, then ten thousand nine hundred less four hundred, then seventeen thousand two hundred less four hundred.
- Divided by thirty, the net outflows are four hundred, three hundred and fifty, and five hundred and sixty a day.

26 Example 10: survival horizon by scenario

Buffer: $6,000m idiosyncratic; $5,600m with wider haircuts. Minimum 14 days

Idiosyncratic	6,000 ÷ 400	**15 days**
Market-wide	5,600 ÷ 350	**16 days**
Combined	5,600 ÷ 560	**10 days**
Board's minimum	Kestrel's own limit	**14 days**

Combined is the most severe, and below the minimum

IN THE LESSON

- The buffer is six thousand million in the idiosyncratic case, and five thousand six hundred in the market wide and combined cases, where haircuts widen as we computed earlier.
- The minimum is fourteen days.
- Idiosyncratic: six thousand over four hundred, fifteen days.
- Market wide: five thousand six hundred over three hundred and fifty, sixteen days.
- Combined: five thousand six hundred over five hundred and sixty, ten days.
- The last row sets Kestrel's own limit of fourteen days beside them.
- Each single shock passes.
- The combined case fails by four days, because the smaller buffer and the larger outflows arrive together.
- A test that ran only one scenario would have missed this.

27 Assumptions: conservative and documented

- Run-off and rollover rates by counterparty type
- Drawdowns on commitments
- Collateral haircuts set for stress
- Management actions: achievable in the scenario
- Conservative and documented

IN THE LESSON

- Assumptions turn a scenario into cash flows.
- Run off and rollover rates are set by counterparty type, because a household with an insured deposit behaves very differently from a fund that lends overnight.
- Drawdowns on commitments are estimated for each type of line.
- Collateral haircuts are set for stress, not for calm markets.
- Management actions, such as selling assets or cutting new lending, are what the bank plans to do in response, and they must be achievable in the scenario.
- Every assumption should be conservative, meaning it errs toward more outflow and less inflow, and documented, so that someone else can see where it came from and challenge it.

28 Example 11: one unreviewed run-off rate

The usual failure: one unreviewed run-off rate of 10% on all $44,000m of funding

Run-off, one rate	44,000 × 10%	**4,400**
Run-off, by counterparty type	3,000 + 2,400 + 6,000	**11,400**
Net per day, one rate	(4,400 + 2,000 − 1,400) ÷ 30	**166.7**
Survival, one rate	6,000 ÷ 166.7	**36 days**
Survival, by type	6,000 ÷ 400	**15 days**

IN THE LESSON

- The usual failure is one unreviewed run off rate.
- Suppose Kestrel had applied ten per cent to all forty four thousand million of its funding: retail thirty thousand, corporate eight thousand and wholesale six thousand.
- Run off would be four thousand four hundred.
- By counterparty type it is three thousand plus two thousand four hundred plus six thousand, eleven thousand four hundred, because wholesale lenders leave far faster than households.
- With one rate, adding the two thousand of drawn lines and subtracting the one thousand four hundred of inflows, net outflow is five thousand over thirty days, about one hundred and sixty six point seven a day.
- The survival horizon would be six thousand over that, thirty six days, against fifteen by type.
- One untested number more than doubles the answer.

29 Example 12: outputs by horizon

Combined case: buffer $5,600m, net outflow $560m a day. Minimum 14 days

Day 5	5,600 − 5 × 560	**+2,800**
Day 10	5,600 − 10 × 560	**0**
Day 14, the minimum	5,600 − 14 × 560	**−2,240**
Survival horizon	5,600 ÷ 560	**10 days**
Against the limit	10 < 14	**Breach**

IN THE LESSON

- In the combined case, the buffer is five thousand six hundred million dollars and net outflow is five hundred and sixty a day, against a minimum of fourteen days.
- A stress test's outputs are cash flow profiles, the surplus or shortfall by horizon, and the survival horizon, compared with limits.
- Here is Kestrel's profile.
- At day five, the surplus is five thousand six hundred less five times five hundred and sixty, which is two thousand eight hundred.
- At day ten, it is exactly zero.
- At day fourteen, the minimum, there is a shortfall of two thousand two hundred and forty.
- The survival horizon is ten days, and ten is below fourteen, so the limit is breached.
- A breach must trigger escalation, which brings us to governance.

30 Governance: approval, challenge, escalation

- Senior management and board approve the test
- Independent challenge of scenarios and assumptions
- Defined escalation to the contingency funding plan
- Kestrel's breach: the plan is activated, not debated

IN THE LESSON

- Governance has three parts.
- First, senior management and the board approve the stress test, its scenarios and its key assumptions, so that the results are owned at the top.
- Second, an independent function, separate from the treasury team that runs the test, challenges the scenarios and assumptions, and asks why each rate was chosen.
- Third, there is defined escalation to the contingency funding plan, the bank's prepared playbook of actions for raising cash in a liquidity crisis, with named owners and triggers.
- When Kestrel's combined case breaches its fourteen day minimum, the plan is activated, not debated.
- Without these three, even a well built test can be ignored when it matters.

31 How it fits with other risk models

- Scenario-based and cash-based, unlike VaR
- VaR: a statistical loss at a confidence level
- Scenarios consistent with market and credit models
- Wider spreads mean wider haircuts; downgrades, calls

IN THE LESSON

- How does the test fit with the bank's other risk models?
- It is scenario based and cash based, unlike value at risk, or V a R, which estimates a statistical loss in value at a confidence level.
- A bank can show a small V a R and still run out of cash, because V a R measures losses, not the timing of payments.
- Still, the scenarios should be consistent with the market and credit risk models.
- If Kestrel's market risk model assumes credit spreads widen sharply, the liquidity test should widen haircuts too.
- If the credit model has Kestrel downgraded, the liquidity test should include the collateral calls a downgrade triggers.

32 Try three quick questions

1. Bonds $900m, $200m pledged, haircut 10%; cash $150m. Net outflow $50m a day. Survival?
   Answer: 700 × 90% + 150 = 780. 780 ÷ 50 = 15.6 days.
2. A bank buys back its own paper to calm the market, though not obliged to. Which kind?
   Answer: Strategic liquidity: a choice to protect the franchise.
3. Parent cash $500m, needs $600m. Subsidiary's $400m surplus is ring-fenced. Position?
   Answer: Shortfall $100m. Lumped view wrongly shows $300m spare.

IN THE LESSON

- Now try three quick questions.
- Pause the video, think, then listen to the answers.
- Question one.
- A bank holds bonds worth nine hundred million dollars, of which two hundred million are pledged, with a stress haircut of ten per cent, plus cash of one hundred and fifty million.
- Net stress outflow is fifty million a day.
- What is the survival horizon?
- Seven hundred million of free bonds times ninety per cent is six hundred and thirty, plus one hundred and fifty of cash makes seven hundred and eighty.
- Divided by fifty, that is fifteen point six days.
- Question two.
- A bank buys back its own paper to calm the market, though not obliged to.
- Which kind of liquidity is this?
- Strategic liquidity, a choice made to protect the franchise.
- Question three.
- A parent has cash of five hundred million and needs six hundred.
- Its subsidiary's surplus of four hundred million is ring fenced.
- What is the parent's position?
- A shortfall of one hundred million.
- The lumped view wrongly shows three hundred million to spare.