CHARTA LEARNING · LESSON NOTES

Liquidity Risk Reporting and Stress Testing

FRM Part II

1 A story: the report nobody could read

- Board gets a 300-page pack every month
- No limits, no trends, no actions: raw data
- A subsidiary's shortfall is buried on page 212
- The board sees a healthy group total
- Fix: write for the reader, add insight

IN THE LESSON

- Imagine Ardley Bank's board.
- Every month it receives a liquidity pack of three hundred pages.
- There are no limits on it, no trends and no actions, just raw data, table after table.
- Somewhere on page two hundred and twelve, a subsidiary is running short of cash.
- Nobody finds it.
- The board looks at a healthy total for the whole group and moves on.
- Nothing in the pack was false.
- The problem was that it was written for nobody in particular, and so it told nobody anything.
- The fix is to write for the reader, and to add insight to the numbers.
- That is what good practice in liquidity reporting is about, and it is the first part of this lesson.

2 Start with the reader

Each reader needs a different depth

Reader	What they need
Board	Key metrics vs limits and triggers
ALCO	Trends, drivers and actions
Treasury	Detail by bucket, currency, entity
Everyone	Detail available on request

IN THE LESSON

- Each reader needs a different depth, so good practice starts with the reader.
- Ardley's internal reports go to three audiences.
- The board needs a short summary: the key metrics, set against their limits and against early warning triggers, which are levels that signal trouble is building before a limit is hit.
- The asset liability committee, or A L C O, is the group of senior managers who run the balance sheet.
- It needs the trends behind the metrics, what is driving them, and the actions proposed.
- Treasury, the team that manages the bank's cash and funding every day, needs full detail, by time bucket, by currency and by legal entity.
- And for everyone, the detail must be available on request, so a short summary never hides anything.

3 What makes a liquidity report good

- Timely: soon after the data date
- Frequency rises as conditions worsen
- Ardley: ALCO monthly, weekly in stress; treasury daily
- Forward-looking, not just today's snapshot
- Documented, consistent definitions and assumptions

IN THE LESSON

- Next, the qualities of a good report.
- It must be timely, produced soon after the date of the data, because liquidity can change in days.
- Its frequency should rise as conditions worsen.
- At Ardley, the asset liability committee sees a report monthly in calm times, and weekly under stress, while treasury watches the position every day.
- A good report is forward looking.
- It shows where liquidity is heading over the coming weeks and months, not only a snapshot of today.
- And it is built on documented, consistent definitions and assumptions.
- If the meaning of liquid asset changes from one month to the next, a trend in the report may be nothing more than a change in definition.

4 Example 1: count only what you can use

Ardley's liquid assets, $m: some are pledged, and all face haircuts

Gross liquid assets	on the balance sheet	**$12,000m**
Less: encumbered	pledged in repo or as margin	**− $3,000m**
Unencumbered	12,000 − 3,000	**$9,000m**
Less: haircuts	about 6.7% of 9,000	**−$600m**
Net usable liquidity	9,000 − 600	**$8,400m**

Gross overstates usable liquidity by $3,600m

IN THE LESSON

- Ardley's liquid assets, in millions of dollars: some are pledged, and all face haircuts.
- This is why a gross total can mislead.
- Ardley holds liquid assets of twelve thousand million dollars on its balance sheet.
- But three thousand million of them are encumbered.
- An asset is encumbered when it is already pledged as collateral, for example in a repo or as margin, so it cannot be sold or pledged again.
- That leaves nine thousand million unencumbered.
- Next come haircuts, the discounts to market value that apply when an asset is sold or borrowed against in a hurry.
- Here they total six hundred million, an average of about six point seven per cent of the nine thousand.
- Net usable liquidity is nine thousand minus six hundred, eight thousand four hundred million.
- The gross figure overstated usable liquidity by three thousand six hundred million dollars.

5 Example 2: the group total can hide a subsidiary

Net usable liquidity vs 30-day stressed net outflows, by legal entity, $m

Parent	7,000 vs 4,000	**+$3,000m**
Subsidiary: Ardley Europe	1,400 vs 2,000	**−$600m**
Group	8,400 vs 6,000	**+$2,400m**
Can cash move between entities?	local rules may trap it	**Not always**

Report by legal entity, currency and business line

IN THE LESSON

- Next, net usable liquidity against thirty day stressed net outflows, by legal entity, because reports should show the position entity by entity.
- The parent has seven thousand million against outflows of four thousand, a surplus of three thousand.
- Its subsidiary, Ardley Europe, has one thousand four hundred million against outflows of two thousand, a shortfall of six hundred.
- The group adds up to eight thousand four hundred against six thousand, a surplus of two thousand four hundred, which looks comfortable.
- But can liquidity move freely between entities?
- Not always: rules in each country can trap cash where it sits, and moving it takes time and approval.
- So the group surplus cannot simply be assumed to cover Ardley Europe.
- That is why good practice reports by legal entity, by currency and by business line.

6 Disclosure, and the usual mistake

- Externally: disclose enough, and regularly
- So the market can judge liquidity management
- Usual mistake: volume without insight
- Raw data with no limits, trends or actions

IN THE LESSON

- So far we have looked inside the bank.
- Externally, good practice is for a bank to disclose enough information, and to do so regularly.
- The purpose is that market participants, such as depositors, lenders and investors, can judge whether the bank's liquidity risk is soundly managed.
- A bank that discloses too little leaves the market to guess, and markets tend to guess the worst in a stress.
- Now the usual mistake, inside or outside: volume without insight.
- That means raw data with no limits, no trends and no actions attached.
- A thick pack feels thorough, but if a reader cannot tell whether a number is good or bad, or what is being done about it, the report has failed.

7 Example 3: one board line done well

Ardley's group LCR, with its context, not as a bare number

Metric and value	group LCR	**140%**
Against limit and trigger	limit 110%, trigger 120%	**Inside both**
Trend	160% three months ago	**−20 points**
Driver	Ardley Europe deposit outflows	**Subsidiary**
Action and owner	move funding to the subsidiary	**Treasury**

IN THE LESSON

- Here is Ardley's group L C R, reported with its context, not as a bare number, as one line of the board summary.
- The metric is the group liquidity coverage ratio, or L C R, which we compute properly later in the lesson.
- Its value is one hundred and forty per cent.
- Against Ardley's own limit of one hundred and ten per cent, and its early warning trigger of one hundred and twenty, it is inside both.
- The trend matters too: three months ago it was one hundred and sixty per cent, so it has fallen by twenty points.
- The driver is named: deposit outflows at Ardley Europe.
- And there is an action with an owner: treasury will move funding to the subsidiary.
- Four pieces of context turn one bare number into something a board can act on.

8 Each report answers its own question

Read each report for the question it was built to answer

Report	Question it answers
Contractual ladder	When do cash flows fall due?
Behavioural ladder	When will they really happen?
LCR	Can we survive 30 days of stress?
NSFR	Is funding stable over one year?
Narrower reports	What does the total hide?

IN THE LESSON

- Read each report for the question it was built to answer.
- Liquidity reports differ in exactly that, and the table pairs each with its question.
- The contractual maturity ladder asks: when do cash flows legally fall due?
- The behavioural ladder asks: when will they really happen?
- The liquidity coverage ratio asks: can the bank survive thirty days of stress?
- The net stable funding ratio, or N S F R, asks: is the bank's funding stable over one year?
- And the narrower reports, on concentration, encumbrance, intraday flows and currency, ask: what does the consolidated total hide?
- Keep these questions in mind.
- Most mistakes in reading liquidity reports come from asking one report a question it was never built to answer.

9 The contractual maturity ladder

- Cash inflows and outflows in time buckets
- Contractual dates: when money is legally due
- Gap in each bucket = inflows − outflows
- Cumulative gap: the gaps added up
- Largest cumulative shortfall matters most

IN THE LESSON

- Start with the contractual maturity ladder.
- It lists the bank's cash inflows and outflows in time buckets, such as overnight, the rest of the first week, the rest of the month, and so on.
- The dates are the contractual ones, meaning when money is legally due.
- In each bucket, the gap is inflows minus outflows, so a negative gap means more cash going out than coming in.
- The cumulative gap adds the gaps up, bucket by bucket, from today.
- Here is the key idea.
- The largest cumulative shortfall is the number that matters, not the gap in any single bucket, because a shortfall in one bucket carries forward until later inflows repay it.

10 Example 4: Ardley's contractual ladder

Corporate banking line, contractual cash flows, $m

Bucket	In	Out	Gap	Cumulative
Overnight	500	1,500	−1,000	−1,000
2–7 days	700	1,100	−400	−1,400
8–30 days	1,800	1,300	+500	−900
1–3 months	2,400	1,000	+1,400	+500

IN THE LESSON

- Here is the contractual ladder for one of Ardley's business lines, corporate banking, in millions of dollars.
- Overnight, five hundred comes in and one thousand five hundred goes out, a gap of minus one thousand, and the cumulative gap is minus one thousand.
- From two to seven days, seven hundred in and one thousand one hundred out, a gap of minus four hundred, taking the cumulative gap to minus one thousand four hundred.
- From eight to thirty days, one thousand eight hundred in and one thousand three hundred out, a gap of plus five hundred, so the cumulative gap recovers to minus nine hundred.
- From one to three months, two thousand four hundred in and one thousand out, plus one thousand four hundred, ending at a cumulative plus five hundred.

11 Reading the ladder

How much cash must corporate banking find from liquid assets?

Worst single-bucket gap	overnight	**−$1,000m**
Cumulative gap at day 7	−1,000 − 400	**−$1,400m**
Cumulative gap at 3 months	−1,400 + 500 + 1,400	**+$500m**
Cash the line must find	largest cumulative shortfall	**$1,400m**

Trap: reading the single-bucket gap or the final total

IN THE LESSON

- How much cash must corporate banking find from liquid assets?
- To answer, read the ladder.
- The worst single bucket gap is overnight, minus one thousand million.
- But by day seven the cumulative gap is minus one thousand minus four hundred, so minus one thousand four hundred million.
- By three months it is minus one thousand four hundred, plus five hundred, plus one thousand four hundred, which is plus five hundred million.
- So the cash this business line must be able to find is the largest cumulative shortfall, one thousand four hundred million, reached at day seven.
- The trap is to read either of the other two numbers.
- The single bucket gap understates the need by four hundred million, and the final positive total hides the hole entirely.

12 Contractual versus behavioural ladders

Same cash flows, different dates

Feature	Contractual	Behavioural
Dates used	Legal due date	Expected behaviour
Demand deposits	All overnight	Stable part long-dated
Strength	Objective, no assumptions	Realistic
Weakness	Unrealistic	Assumptions may fail in stress

IN THE LESSON

- Same cash flows, different dates.
- A contractual ladder has a weakness: real customers do not behave like contracts.
- The behavioural ladder replaces contractual dates with expected behaviour, as the table compares.
- On the dates used, the contractual ladder takes the legal due date, while the behavioural ladder uses expected behaviour.
- On demand deposits, which customers may withdraw at any time, the contractual ladder puts them all overnight, while the behavioural ladder treats the stable part as long dated, because that part tends to stay with the bank for years.
- The strength of the contractual ladder is that it is objective, with no assumptions.
- The behavioural ladder is more realistic.
- But that realism is also its weakness, because its assumptions may fail in a stress, exactly when the report matters most.

13 Example 5: Ardley's behavioural ladder

Of $1,000m demand deposits due overnight, Ardley treats $800m as stable

Stable part moved	beyond one year	**$800m**
Overnight outflow	1,500 − 800	**$700m**
Overnight gap	500 − 700	**−$200m**
Cumulative gap at day 7	−200 − 400	**−$600m**
Contractual view, day 7	from Example 4	**−$1,400m**

IN THE LESSON

- Of one thousand million of demand deposits due overnight in the corporate banking ladder, Ardley treats eight hundred million as stable.
- So the behavioural ladder moves that stable part beyond one year.
- The overnight outflow becomes one thousand five hundred minus eight hundred, which is seven hundred million.
- The overnight gap becomes five hundred minus seven hundred, minus two hundred.
- Adding the unchanged gap of minus four hundred for days two to seven, the cumulative gap at day seven is minus six hundred million.
- On the contractual view it was minus one thousand four hundred.
- The behavioural ladder is less severe, so its assumptions must be documented and tested, because stable deposits are only stable until a stress.

14 The liquidity coverage ratio

LCR = HQLA ÷ (Outflows − capped Inflows)
30 days of stress; inflows capped at 75%; at least 100%

High quality liquid assets	Liquid assets, after haircuts
Stressed outflows	Expected over the next 30 days
Stressed inflows	Capped at 75% of outflows

IN THE LESSON

- Now the first of the two Basel ratios.
- The liquidity coverage ratio asks whether the bank can survive thirty days of stress on its own resources.
- On top is H Q L A, high quality liquid assets: assets that can be turned into cash quickly with little loss, counted after haircuts.
- Below is net cash outflows, which is the stressed outflows expected over the next thirty days, minus the stressed inflows over the same thirty days, with inflows capped at seventy five per cent of outflows, so some cover must always come from the buffer.
- The ratio must be at least one hundred per cent.
- In words: the bank's stock of liquid assets must at least cover what it would lose, net, in a thirty day stress.
- Notice which way up it is: the buffer on top, the need below.

15 Example 6: Ardley's LCR

HQLA $8,400m. 30-day stressed outflows $8,000m, inflows $2,000m (under the 75% cap)

Net cash outflows	8,000 − 2,000	**$6,000m**
LCR	8,400 ÷ 6,000	**140%**
Minimum		**100%**
HQLA above the minimum	8,400 − 6,000	**$2,400m**
Wrong way up	6,000 ÷ 8,400	**71%**

Simplified: HQLA taken as net usable liquidity

IN THE LESSON

- Ardley's high quality liquid assets are the eight thousand four hundred million of net usable liquidity from Example one.
- Over thirty days of stress, it expects outflows of eight thousand million and inflows of two thousand million.
- Inflows of two thousand are well under the cap of seventy five per cent of eight thousand.
- Net cash outflows are eight thousand minus two thousand, six thousand million.
- The ratio is eight thousand four hundred divided by six thousand, one hundred and forty per cent.
- The minimum is one hundred per cent.
- So Ardley holds liquid assets two thousand four hundred million above what it needs, the same group surplus we saw by legal entity.
- The classic error is to put it the wrong way up: six thousand over eight thousand four hundred, about seventy one per cent, which would wrongly suggest a breach.
- For simplicity, we treat Ardley's net usable liquidity as its H Q L A; in practice the regulatory haircuts and caps can give a different figure.

16 The net stable funding ratio

NSFR = ASF ÷ RSF
Over one year; must be at least 100%

Available stable funding	Funding expected to stay for at least a year
Required stable funding	Stable funding the assets need, by how illiquid

IN THE LESSON

- The second ratio looks further ahead.
- The net stable funding ratio compares available stable funding with required stable funding, over a one year horizon.
- Available stable funding is the funding expected to stay with the bank for at least a year, such as capital, long term debt and the stable part of deposits, each weighted by how stable it is.
- Required stable funding is the amount of stable funding the bank's assets need, weighted by how hard each asset would be to turn into cash.
- A long term loan needs a lot.
- Cash needs almost none.
- This ratio must also be at least one hundred per cent.
- The liquidity coverage ratio is about surviving a month.
- The net stable funding ratio is about the structure of funding over a year.

17 Example 7: Ardley's NSFR

Weights below are assumptions for this example, $m

Available: capital, long-term debt	6,000 × 100%	**$6,000m**
Available: deposits	12,000 × 80%	**$9,600m**
Required: loans, other assets	16,000×75% + 2,000×50%	**$13,000m**
NSFR	(6,000 + 9,600) ÷ 13,000	**120%**
Wrong way up	13,000 ÷ 15,600	**83%**

IN THE LESSON

- Here is Ardley's net stable funding ratio, using weights that are simply assumptions for this example.
- Capital and long term debt of six thousand million count in full, giving six thousand.
- Deposits of twelve thousand million are weighted at eighty per cent, giving nine thousand six hundred.
- On the other side, loans of sixteen thousand million at seventy five per cent, and other assets of two thousand million at fifty per cent, give required stable funding of twelve thousand plus one thousand, thirteen thousand million.
- The ratio is six thousand plus nine thousand six hundred, which is fifteen thousand six hundred million of available stable funding, divided by thirteen thousand, one hundred and twenty per cent, above the minimum.
- Upside down, it would be about eighty three per cent, and once again a false alarm.

18 What a consolidated ratio hides

A healthy group ratio can hide a problem in one place

Report	What it exposes
Concentration	Reliance on a few funders or markets
Encumbrance	Assets already pledged
Intraday	Peak cash need within the day
Currency	A shortfall in one currency

IN THE LESSON

- A group ratio of one hundred and forty per cent can still hide a problem in one place, which is why banks add narrower reports.
- A concentration report exposes reliance on a few funding providers or markets: if one large lender walks away, a big hole opens at once.
- An encumbrance report shows which assets are already pledged, so they cannot be used again.
- An intraday report shows the peak cash need within the day, because payments often go out in the morning before receipts arrive in the afternoon.
- A currency report shows a shortfall in one currency, which surplus cash in another currency may not cover in a stress.
- Each answers a narrow question that a single consolidated ratio cannot.

19 Example 8: Ardley's LCR by currency

Ardley's group LCR of 140%, split by currency, $m

US dollars: HQLA ÷ net outflows	7,800 ÷ 4,500	**173%**
Euros: HQLA ÷ net outflows	600 ÷ 1,500	**40%**
Group: all currencies	8,400 ÷ 6,000	**140%**
Euro shortfall at 100%	1,500 − 600	**$900m**

IN THE LESSON

- Here is Ardley's group ratio of one hundred and forty per cent, split by currency.
- In U S dollars, high quality liquid assets are seven thousand eight hundred million against net outflows of four thousand five hundred, a ratio of about one hundred and seventy three per cent.
- In euros, liquid assets are only six hundred million against net outflows of one thousand five hundred, a ratio of forty per cent.
- Together, the group shows eight thousand four hundred over six thousand, the one hundred and forty per cent we computed.
- To reach one hundred per cent in euros alone, Ardley would need one thousand five hundred minus six hundred, nine hundred million more euro liquidity.
- Swapping dollars into euros in a stress may be costly, or impossible, so the euro shortfall is real.

20 Mistakes to avoid when reading reports

- Do not invert the ratios: resource on top
- The single-bucket gap is not the answer
- A behavioural ladder rests on assumptions
- A group ratio can hide an entity or currency
- Read each report for its own question

IN THE LESSON

- Here are the mistakes to avoid.
- First, do not invert the ratios.
- The liquidity coverage ratio is high quality liquid assets over net outflows, and the net stable funding ratio is available over required stable funding.
- In both, the resource is on top.
- Second, do not read the single bucket gap of a ladder as the answer.
- The largest cumulative shortfall is what matters.
- Third, a behavioural ladder rests on assumptions, and it is only as good as they are, so ask how they were set and tested.
- Fourth, a healthy consolidated ratio can hide a shortfall in one entity or one currency, as Ardley Europe and the euro showed.
- Above all, read each report for its own question.

21 What a stress test report must state

- Aim: a reader can judge and trust it
- Scenario: idiosyncratic, market, combined
- Horizon: how far ahead the test looks
- Run-off rates and rollover of funding
- Haircuts and credit-line drawdowns

IN THE LESSON

- Now to the liquidity stress test report.
- Its aim is that a reader can judge the result and trust it, and that starts with stating what was tested.
- First, the scenario.
- An idiosyncratic scenario hits only this bank, for example a rating downgrade.
- A market wide scenario hits everyone, for example funding markets freezing.
- A combined scenario has both at once.
- Second, the horizon: how far ahead the test looks.
- Third, the key assumptions.
- Run-off rates are the share of each funding source that leaves.
- Rollover is the share of maturing funding that is renewed.
- Haircuts reduce the cash value of assets.
- Drawdowns are how much customers draw on their credit lines.
- A result with hidden assumptions cannot be trusted.

22 Example 9: Ardley's stress assumptions

Combined scenario, 90-day horizon. Assumptions for month one, $m

Retail deposits run off	12,000 × 10%	**$1,200m**
Wholesale: only 20% rolls over	5,000 × 80%	**$4,000m**
Credit lines drawn	7,000 × 40%	**$2,800m**
Month-one stressed outflows	Sum of the three outflows	**$8,000m**
Inflows: half of $4,000m due	4,000 × 50%	**$2,000m**

Haircuts as in Example 1

IN THE LESSON

- Ardley runs a combined scenario over a ninety day horizon.
- Here are its assumptions for the first month.
- Retail deposits of twelve thousand million run off at ten per cent, an outflow of one thousand two hundred million.
- Wholesale funding of five thousand million, borrowed from other financial firms, is assumed to roll over only twenty per cent, so eighty per cent leaves, four thousand million.
- Customers draw forty per cent of seven thousand million of credit lines, two thousand eight hundred million.
- Month one stressed outflows add up to eight thousand million.
- Inflows of four thousand million are contractually due, and Ardley assumes only half arrive, two thousand million.
- For simplicity, these are the same month one figures we used in the L C R example; the regulatory ratio itself uses prescribed run-off rates.
- Haircuts are those of Example one.

23 What the report shows, bucket by bucket

- Stressed outflows against stressed inflows
- Capacity from unencumbered liquid assets
- Cumulative surplus or shortfall
- Survival horizon: capacity first exceeded

IN THE LESSON

- Having stated the scenario, the report shows the results by time bucket.
- First, stressed outflows against stressed inflows, giving a net outflow in each bucket.
- Second, the counterbalancing capacity.
- That is the cash the bank can raise from its unencumbered liquid assets, after haircuts, by selling them or borrowing against them.
- Third, the cumulative surplus or shortfall: capacity minus the cumulative net outflow up to that point.
- And fourth, the headline number, the survival horizon.
- It is the first point at which cumulative net stressed outflows exceed the capacity.
- Notice the word cumulative again.
- As with the ladder, what matters is how outflows build up over time, not any single bucket.

24 Example 10: stressed flows by bucket

Combined scenario, $m

Bucket	Outflows	Inflows	Net outflow
Week 1	4,500	1,000	3,500
Weeks 2–4	3,500	1,000	2,500
Month 2	2,800	1,000	1,800
Month 3	2,600	1,000	1,600

IN THE LESSON

- Here are Ardley's stressed flows in the combined scenario, in millions of dollars.
- In week one, outflows are four thousand five hundred and inflows one thousand, a net outflow of three thousand five hundred.
- In weeks two to four, outflows are three thousand five hundred and inflows one thousand, net two thousand five hundred.
- In month two, outflows ease to two thousand eight hundred, with inflows of one thousand, net one thousand eight hundred.
- In month three, outflows are two thousand six hundred and inflows one thousand, net one thousand six hundred.
- Weeks one to four sum to Example nine: outflows of eight thousand and inflows of two thousand.
- Every bucket shows money leaving, but the pace slows as the stress goes on.

25 Example 10: cumulative position against capacity

Capacity: unencumbered liquid assets after haircuts, $8,400m

By end of	Cumulative net outflow	Capacity	Surplus
Week 1	3,500	8,400	+4,900
Month 1	6,000	8,400	+2,400
Month 2	7,800	8,400	+600
Month 3	9,400	8,400	−1,000

IN THE LESSON

- Ardley's capacity, its unencumbered liquid assets after haircuts, is eight thousand four hundred million, held constant here for simplicity.
- Set the cumulative net outflow against it.
- By the end of week one, cumulative net outflow is three thousand five hundred, leaving a surplus of four thousand nine hundred.
- By the end of month one it is six thousand, leaving two thousand four hundred, the same surplus the liquidity coverage ratio showed.
- By the end of month two it is seven thousand eight hundred, leaving just six hundred.
- By the end of month three it is nine thousand four hundred, which exceeds capacity: a shortfall of one thousand million.
- So somewhere inside month three, Ardley runs out of usable liquidity.
- That point is the survival horizon.

26 Example 11: survival horizon against appetite

Month 3 net outflow of $1,600m is assumed to be spread evenly over 30 days

Surplus left after month 2	8,400 − 7,800	**$600m**
Days of month 3 it covers	600 ÷ 1,600 × 30	**11.25 days**
Survival horizon	60 + 11.25	**about day 71**
Ardley's risk appetite	survive the combined stress	**90 days**
Verdict	71 < 90	**Breach**

IN THE LESSON

- Assume month three's net outflow of one thousand six hundred million is spread evenly over thirty days, and find the survival horizon.
- The surplus left after month two is eight thousand four hundred minus seven thousand eight hundred, six hundred million.
- That covers six hundred over one thousand six hundred of the month, times thirty days, which is eleven and a quarter days.
- So the survival horizon is sixty plus eleven and a quarter, about day seventy one.
- Now compare with risk appetite.
- Ardley's board has said the bank must survive the combined stress for ninety days.
- Seventy one is less than ninety, so the result is a breach of appetite.
- The report must say so plainly, on its first page.

27 Example 12: sensitivity to haircuts

What if haircuts widen and capacity falls by 10%?

Capacity after wider haircuts	8,400 × 90%	**$7,560m**
Cumulative net outflow, day 30	3,500 + 2,500	**$6,000m**
Cumulative net outflow, day 60	6,000 + 1,800	**$7,800m**
Days of month 2 covered	(7,560 − 6,000) ÷ 1,800 × 30	**26 days**
Survival horizon	30 + 26	**about day 56**

One assumption moves the answer by about 15 days

IN THE LESSON

- What if haircuts widen in the stress and capacity falls by ten per cent?
- Asking that is sensitivity analysis, which a good report adds, because it shows how much the result moves when one assumption changes.
- Capacity becomes eight thousand four hundred times ninety per cent, seven thousand five hundred and sixty million.
- Cumulative net outflow by day thirty is three thousand five hundred plus two thousand five hundred, six thousand.
- By day sixty it is six thousand plus one thousand eight hundred, seven thousand eight hundred, which is now above capacity.
- So the money runs out in month two.
- The spare one thousand five hundred and sixty, divided by one thousand eight hundred, times thirty, covers twenty six days.
- The survival horizon falls to about day fifty six, some fifteen days earlier.

28 Example 13: from result to action

A $1,000m shortfall at day 90 breaches appetite: act now

Shortfall at day 90	9,400 − 8,400	**−$1,000m**
Raise term funding now	maturing after 90 days	**+$700m**
Slow new lending	months 2 and 3	**+$400m**
Position at day 90 after	−1,000 + 700 + 400	**+$100m**
Then: contingency funding plan	triggers, owners, steps	**CFP**

IN THE LESSON

- A shortfall of one thousand million at day ninety breaches Ardley's appetite, so it must act now.
- A stress result is only useful if it leads to action, so the report links the breach to management actions and to the contingency funding plan.
- The shortfall is nine thousand four hundred minus eight thousand four hundred.
- Treasury proposes to raise seven hundred million of term funding now, maturing after ninety days, which adds to capacity.
- The business agrees to slow new lending in months two and three, saving four hundred million of outflows.
- The position at day ninety becomes minus one thousand, plus seven hundred, plus four hundred, a surplus of one hundred million.
- Then the contingency funding plan, or C F P, sets out the triggers, owners and steps if a real stress begins.

29 Example 14: a reverse stress test

Start from failure: what retail run-off empties capacity within 30 days?

Capacity	after haircuts	**$8,400m**
Month-one net outflow, base	8,000 − 2,000	**$6,000m**
Extra outflow that breaks Ardley	8,400 − 6,000	**$2,400m**
Retail run-off needed	(1,200 + 2,400) ÷ 12,000	**30%**
Assumed in the scenario		**10%**

IN THE LESSON

- Start from failure, and ask what retail run-off would empty Ardley's capacity within thirty days.
- That is a reverse stress test.
- An ordinary stress test starts from a scenario and asks what happens, while a reverse stress test starts from failure and works back to the scenario that causes it.
- Capacity after haircuts is eight thousand four hundred million.
- The base month one net outflow is eight thousand minus two thousand, six thousand.
- So the extra outflow that would break Ardley is eight thousand four hundred minus six thousand, two thousand four hundred million.
- If it all came from retail deposits, the outflow would be one thousand two hundred plus two thousand four hundred, divided by twelve thousand, a run-off of thirty per cent.
- The scenario assumed ten.
- Management must now judge how plausible a thirty per cent retail run is.

30 Mistakes to avoid in stress reports

Three ways a stress report misleads, shown with Ardley's numbers

Single-bucket check	largest net outflow 3,500	**Looks safe**
Cumulative check	9,400 by day 90 vs 8,400	**Breach**
Full rollover in market stress	wholesale outflow 4,000 → 0	**Too rosy**
Month-one net outflow then	6,000 − 4,000	**$2,000m**
Breach of appetite	do not soften the scenario	**Act**

IN THE LESSON

- Here are the usual errors, using Ardley's numbers.
- First, comparing single period outflows rather than cumulative ones.
- The largest net outflow in any bucket is three thousand five hundred, far below capacity of eight thousand four hundred, so every bucket looks safe.
- Yet cumulative outflows reach nine thousand four hundred by day ninety, a breach.
- Second, accepting optimistic assumptions, such as full rollover of wholesale funding in a market wide stress.
- That would cut the wholesale outflow from four thousand to zero, and month one net outflow would be six thousand minus four thousand, only two thousand.
- Third, when a result breaches appetite, the answer is to act, not to soften the scenario until the breach disappears.

31 Try three quick questions

1. Bucket gaps −$300m, −$500m, +$400m, +$600m. Largest cumulative shortfall?
   Answer: Cumulative −300, −800, −400, +200: $800m.
2. HQLA $3,000m; 30-day stressed outflows $4,000m, inflows $1,500m. LCR?
   Answer: Net 2,500. 3,000 ÷ 2,500 = 120%.
3. Cum. net outflows, months 1–3: 2,000, 3,500, 5,000; capacity 4,000 ($m). Survival?
   Answer: 4,000 − 3,500 = 500 left; month 3 net 1,500; 500 ÷ 1,500 × 30 = 10 days: day 70.

IN THE LESSON

- Pause the video, think, then listen.
- Question one.
- Bucket gaps on a ladder are of minus three hundred, minus five hundred, plus four hundred and plus six hundred million dollars.
- What is the largest cumulative shortfall?
- Cumulative gaps run minus three hundred, minus eight hundred, minus four hundred, plus two hundred, so eight hundred million dollars.
- Question two.
- High quality liquid assets are three thousand million, and thirty day stressed outflows and inflows are four thousand and one thousand five hundred million.
- What is the L C R?
- Three thousand over net outflows of two thousand five hundred, one hundred and twenty per cent.
- Question three.
- Cumulative stressed net outflows are two thousand, three thousand five hundred and five thousand million by the ends of months one, two and three.
- Capacity is four thousand million.
- With even outflows each month, what is the survival horizon?
- Four thousand minus three thousand five hundred leaves five hundred.
- Month three's net outflow is one thousand five hundred, so five hundred covers ten days.
- So, day seventy.