CHARTA LEARNING · LESSON NOTES

Proposing, implementing and rebalancing an allocation

Asset Allocation

1 A proposal answers a brief

- The policy statement is the brief
- Wants: the return the client requires
- Limits: risk, horizon, cash, tax, law
- Propose a mix, then defend it

IN THE LESSON

- Think of an architect handed a brief.
- Three bedrooms, a fixed budget, a garden that must face south.
- A design that ignores the budget is no good.
- Proposing an allocation works the same way.
- The brief is the investment policy statement, the I P S.
- It says what the client wants to achieve, which is the required return, and the limits the client faces: the risk they can and will bear, the time horizon, the cash they need, taxes, legal rules and any unusual circumstances.
- Your job is to find a mix that meets the brief, and then to explain why it does.

2 Linden Hollow's brief

The foundation holds 80 million; adviser Ines Calder

Fact	What it sets
Spend 4% + inflation 2%	Needs 6.0%
Trustees' volatility cap	10%
Grant 6.4m due in a year	8% in cash
Horizon and tax	Forever, none

IN THE LESSON

- Meet the foundation.
- It holds eighty million and gives away four per cent of its value each year to community arts projects.
- Inflation runs at two per cent a year, so to keep the gift worth the same, the fund must earn about four per cent plus two per cent, which is six point zero per cent.
- That is the required return.
- The trustees say they will not accept volatility above ten per cent.
- A workshop grant of six point four million, which is eight per cent of the fund, falls due within a year, so at least eight per cent must sit in cash.
- The foundation lasts forever and pays no tax.

3 Ability and willingness to bear risk

- Ability is capacity: horizon, wealth, cushion
- Willingness is attitude: the client's comfort
- When they disagree, the lower one governs
- Foundation: high ability, willingness capped at 10%

IN THE LESSON

- Two friends are offered a ride on a tall roller coaster.
- One is fit but hates heights.
- The other loves heights but has a bad back.
- Two different things matter.
- Ability to bear risk is capacity: the horizon, the wealth, the cushion that lets losses be absorbed.
- Willingness is attitude: how much risk the client is actually comfortable with.
- When the two disagree, the lower one governs.
- The foundation has a very high ability, with a forever horizon and no debts, but the trustees' willingness is lower, and it is written down as the ten per cent cap.
- The cap rules.

4 Which approach fits the investor?

If the investor ..., then use ...

Investor profile	Approach
No liabilities, risk and return	Asset-only
Owes fixed future payments	Liability-relative
Several goals, differing urgency	Goals-based

IN THE LESSON

- There are three frames.
- The asset only approach looks at assets alone and asks for the best return for the risk taken.
- It suits an investor with no liabilities, like the foundation, so that is our frame.
- The liability relative approach starts from the payments owed, as with a pension scheme, and asks whether assets will cover them.
- The goals based approach splits the money by goal, such as safe money for an essential need and growth money for a wish, each with its own required probability of success.

5 From the brief to a choice

Proposing an allocation

Read the policy → Pick the approach → Drop any breach → Take least risk

IN THE LESSON

- Here is the whole method as four boxes.
- First, read the policy statement and write down the return needed and every limit.
- Second, pick the approach, which for the foundation is asset only.
- Third, drop any candidate that breaks a limit.
- A candidate with a higher return gets no pass.
- Fourth, among those that survive, take the one that meets the return need with the least risk, or the one with the highest utility, a score we meet in a moment.
- Limits come first and preferences second.

6 Four candidates on one picture

Chart: Expected return (%) vs Volatility (% a year)

- Cap 10%
- Need 6.0%
- ×
- A 7.2% at 12.5%
- ×
- B 6.4% at 9.6%
- ×
- C 6.1% at 8.2%
- ×
- D 5.2% at 6.0%

IN THE LESSON

- Ines prepares four candidate mixes.
- Along the bottom is volatility, the risk, in per cent a year.
- Up the side is expected return.
- The vertical line is the trustees' cap of ten per cent.
- The horizontal line is the return needed, six point zero per cent.
- A mix is acceptable only above the horizontal line and left of the vertical one.
- Candidate A offers seven point two per cent at volatility twelve point five per cent, which is past the cap.
- D is calm, five point two per cent at volatility six point zero per cent, but its return is under the need.
- B, six point four per cent at nine point six per cent, and C, six point one per cent at eight point two per cent, both sit inside the allowed corner.

7 Example 1: screen the candidates

Tests: return 6.0%+, volatility 10%-, cash 8%+

Candidate A	7.2% ret, 12.5% vol, 5% cash	**fails**
Candidate B	6.4% ret, 9.6% vol, 9% cash	**passes**
Candidate C	6.1% ret, 8.2% vol, 11% cash	**passes**
Candidate D	5.2% ret, 6.0% vol, 20% cash	**fails**

IN THE LESSON

- Now the screen against three tests: return at least six point zero per cent, volatility at most ten per cent, cash at least eight per cent.
- Candidate A has return seven point two per cent, volatility twelve point five per cent and cash five per cent.
- It fails twice, because volatility is over ten per cent and cash is under eight per cent.
- B has return six point four per cent, volatility nine point six per cent and cash nine per cent.
- It passes all three.
- C has return six point one per cent, volatility eight point two per cent and cash eleven per cent.
- It passes all three.
- D has return five point two per cent, under six point zero per cent, so it fails even though it is the safest, with cash of twenty per cent.
- B and C survive.
- Notice that the best looking return, A, was the first to go.

8 Choosing among the survivors

$U = E(R) - \frac{1}{2} \times \lambda \times \sigma^2$

Utility	Score used to compare mixes
Expected return	The mix's mean return
Risk aversion	Caution level: 4
Variance	Volatility squared

IN THE LESSON

- Both B and C work, so how do we choose?
- One answer is to pick the mix that meets the return need with the least risk.
- Another is a utility score.
- Utility equals expected return minus one half times lambda times variance.
- Lambda is the investor's risk aversion; the bigger it is, the more each unit of risk hurts.
- Variance is volatility squared.
- In plain words, utility takes the return and subtracts a penalty for the risk taken, and the mix with the higher score suits that investor better.
- For the foundation, the trustees' caution gives a lambda of four which we use in the example.
- Work in decimals when you use the formula.

9 Example 2: B against C

Risk aversion 4: U = return − 2 × volatility squared

Risk penalty, B	2 × 0.096²	**1.84%**
Utility of B	6.4% − 1.84%	**4.56%**
Risk penalty, C	2 × 0.082²	**1.34%**
Utility of C	6.1% − 1.34%	**4.76%**
Higher utility	C beats B by 0.20 points	**C**

IN THE LESSON

- Take B first.
- The risk penalty is half of lambda, which is two times the variance, zero point zero nine six squared.
- That is one point eight four percentage points.
- Utility is six point four per cent minus one point eight four per cent, which is four point five six per cent.
- Now C.
- The penalty is two times zero point zero eight two squared, which is one point three four points, so utility is six point one per cent minus one point three four per cent, which is four point seven six per cent.
- C has the higher utility.
- B earns a higher return, but for a cautious trustee board the extra risk costs more than the extra return is worth.

10 Defending the choice

Mix C: equities 42, bonds 35, real estate 12, cash 11

Feature of mix C	Client fact it answers
Cash 11% (8.8m)	Grant due in a year
Volatility 8.2%	Inside the 10% cap
Return 6.1%	Clears the 6.0% need
Utility 4.76%	Beats B at 4.56%

IN THE LESSON

- A good defence ties each feature of the mix to a fact about the client.
- Hold eleven per cent in cash, eight point eight million, because the grant falls due within a year.
- Accept volatility of eight point two per cent because the trustees set a cap of ten per cent and this leaves a margin.
- Expect a return of six point one per cent because the foundation needs six point zero per cent.
- And prefer C to B because its utility of four point seven six per cent beats four point five six per cent.
- Say what could go wrong too.
- The margin on return is thin, and returns are forecasts, so the mix may fall a little short.
- The trap is picking A because it clears the return target while ignoring a risk limit.

11 A neutral place to start

- Start from what investors collectively hold
- Weights are market values of all risky assets
- Move away only for a stated reason
- A starting line, not a finishing line

IN THE LESSON

- Before a race, runners line up on the same starting line.
- Nobody gets a head start unless there is a stated reason.
- The global market portfolio plays that role for an allocation.
- Under the C A P M, the capital asset pricing model, if every investor shared the same forecasts, each would hold the same risky portfolio: every risky asset, in proportion to its market value.
- That is the market portfolio.
- It is not an answer to a client's brief.
- It is the neutral reference from which you depart, and each departure needs a reason.

12 The market in one picture

Value (trillions)

Equities	**102 (51%)**
Bonds	**68 (34%)**
Real estate	**20 (10%)**
Other	**10 (5%)**

Illustrative total: 200 trillion

IN THE LESSON

- Here is an illustration with made up round numbers.
- Global equities are worth one hundred and two trillion, fifty one per cent of the total.
- Bonds are worth sixty eight trillion, thirty four per cent.
- Real estate is worth twenty trillion, ten per cent.
- Other assets, such as private companies and commodities, are worth ten trillion, five per cent.
- The total is two hundred trillion.
- Each weight is just its value divided by the total.
- When prices rise, the value rises and the weight follows, so someone holding these weights does not have to trade merely because prices moved.
- That is why the portfolio is cheap to keep.

13 Why it makes a good reference

- Needs no return forecasts
- Macro-consistent: it is what investors hold
- Cheap to keep: weights follow prices
- In practice a proxy, not the full market

IN THE LESSON

- There are three reasons.
- First, it needs no forecasts of returns, which is a large saving, because forecasts are the weakest part of most allocation work.
- Second, it is consistent with the whole economy: it is simply what investors, taken together, actually hold, so it cannot be a bet against the market.
- Third, it is cheap to maintain, because weights drift with prices.
- There is a catch: the true market portfolio includes assets nobody can buy, such as private businesses.
- So in practice we use a proxy, global equities and bonds, perhaps with real estate and a few other assets.

14 Example 3: reading the market proxy

Risk-free 2%, market premium over it 4%

Proxy weights	102 ÷ 170 and 68 ÷ 170	**60% / 40%**
Market volatility	16%, 6%, correlation 0.20	**10.35%**
Sensitivity to market	from the same inputs	**1.51 / 0.24**
Implied returns	2% + sensitivity × 4%	**8.0% / 3.0%**
Check	0.6 × 8.0% + 0.4 × 3.0%	**6.0%**

IN THE LESSON

- Take equities at one hundred and two trillion and bonds at sixty eight trillion, a total of one hundred and seventy.
- The weights are sixty per cent and forty per cent.
- Assume volatility of sixteen per cent for equities, six per cent for bonds, and a correlation of zero point two zero.
- The proxy then has volatility of ten point three five per cent.
- Now reverse optimisation: which expected returns would make investors content to hold exactly these weights?
- Measured against the market, equities have a sensitivity of one point five one and bonds zero point two four.
- With a risk free rate of two per cent and a market premium of four per cent, the implied returns are eight point zero per cent and three point zero per cent.
- Check: sixty per cent of eight point zero plus forty per cent of three point zero is six point zero per cent, which is two per cent plus four per cent.
- These can feed an optimiser.

15 Example 4: departures from the market

Equities 42, bonds 35, real estate 12, cash 11 vs 51, 34, 10, 5

Asset class and reason	Tilt
Cash (grant due)	+11
Equities (volatility cap)	−9
Real estate, bonds (income)	+3
Other (hard to buy)	−5

IN THE LESSON

- Now see how Ines departs.
- The proxy has volatility just over the trustees' cap, and holds no cash for the grant, so it cannot be used as it stands.
- Mix C holds equities forty two bonds thirty five real estate twelve and cash eleven.
- Against the market weights, that is eleven more in cash, because the grant is due; nine less in equities, because of the volatility cap; three more across real estate and bonds, for steady income and a cushion; and five less in other assets, which are hard to buy in size.
- Each tilt has a stated reason and a size.
- A tilt is never free: it is a bet that the client's facts matter more than the market's weights, and it can be wrong.

16 Mistakes to avoid so far

- Top return chosen, risk limit ignored
- Cash for planned spending forgotten
- Market portfolio called the answer, not the start
- Tilts made with no reason or size

IN THE LESSON

- Four traps so far.
- First, choosing the highest return mix because it meets the return target, and ignoring an explicit risk limit.
- Second, forgetting the cash a client needs for planned spending.
- Third, treating the global market portfolio as the recommendation instead of the starting point, when it knows nothing about this client.
- Fourth, treating a departure as costless.
- If you cannot name the client fact behind a tilt, and say how large it should be, the tilt should not be there.

17 Two choices in implementation

- How much active risk, class by class?
- Tests: efficiency, skill, fees, governance
- Which vehicle delivers each mandate?
- Board meets four times a year: limited oversight

IN THE LESSON

- Choosing the mix is only half the job.
- Planning a trip, you pick the destination, then the route and the vehicle.
- Here there are two choices.
- The first is how active to be in each asset class.
- Active management tries to beat an index; passive tracks it.
- Judge that by four tests: how efficient the market is, since efficient markets are hard to beat; whether there is real evidence of manager skill; what the fees cost; and whether the board can monitor managers.
- The second choice is which vehicle delivers the exposure.
- Linden Hollow's board meets four times a year, so its capacity to oversee managers is limited.

18 Example 5: active or passive?

Four tests applied to each asset class

Asset class	Choice
Developed large-cap equities	Passive
Investment-grade bonds	Passive
Emerging-market equities	Part active
Real estate	Active, private

IN THE LESSON

- Apply the four tests to each part of mix C.
- Developed market large company shares are a deep, heavily researched market.
- Beating the index there is hard, fees are high next to the likely gain, and the board has no evidence of skill.
- So go passive.
- Investment grade bonds are also large and efficient, so passive again.
- Emerging market shares are less efficient and cover many smaller companies, so part of that allocation can be active if the board finds a manager with a track record it can monitor.
- Real estate has no investable index in this case, so it is held through an active private partnership.

19 From fully passive to fully active

- Index fund or ETF
- Smart beta
- Core-satellite
- Active fund
- Private partnership

IN THE LESSON

- Here are the choices as a line.
- At the left, passive.
- An index mutual fund or exchange traded fund tracks the index at very low cost.
- A separately managed account holds the index for you alone.
- Futures and total return swaps give index exposure with little cash, and they also allow overlays, which adjust the portfolio's risk without selling the holdings.
- Next comes smart beta, or factor based investing: rule based strategies that tilt toward factors such as value or size.
- In the middle sits core satellite, a passive core with a few active satellites.
- Further right are active funds and managed accounts.
- At the far right are private assets, usually held through limited partnerships.

20 Cost and risk of core-satellite

Blended fee = Wc × Fc + Ws × Fs
Active risk ≈ Ws × satellite tracking error

Core weight	Share held in the index
Core fee	Cost of the index core
Satellite weight	Share held in active
Satellite fee	Cost of the active slice
Satellite risk	Gap volatility vs benchmark

IN THE LESSON

- A core satellite structure puts most of the money in a cheap passive core and a smaller share in active satellites.
- The blended fee is the core weight times the core fee, plus the satellite weight times the satellite fee.
- And active risk is measured by tracking error, the volatility of the gap between the portfolio's return and the benchmark's.
- If the core tracks the index closely, nearly all active risk comes from the satellites, so total active risk is roughly the satellite weight times the satellites' own tracking error.
- It is an approximation.

21 Example 6: does active pay?

Extra fee = active fee less 0.05% index fee

Developed: extra fee	0.70% − 0.05%	**0.65%**
Developed: net edge	alpha 0.40% − 0.65%	**−0.25%**
Emerging: extra fee	0.90% − 0.05%	**0.85%**
Emerging: net edge	alpha 1.50% − 0.85%	**+0.65%**

IN THE LESSON

- Suppose a developed market manager expects a gross edge over the index, called alpha, of zero point four zero per cent a year.
- The manager charges zero point seven zero per cent, an index fund zero point zero five per cent, so the extra fee is zero point six five per cent.
- The net edge is zero point four zero per cent minus zero point six five per cent, a loss of zero point two five per cent.
- Now an emerging markets manager with expected alpha of one point five zero per cent and a fee of zero point nine zero per cent.
- The extra fee is zero point eight five per cent, and the net edge is plus zero point six five per cent.
- That could be worth paying for, if the alpha estimate is believable.
- The trap is paying for active management in an efficient market without evidence that the added risk will be rewarded.

22 Example 7: a core-satellite sleeve

Equities are 42% of 80 million

Equity sleeve	42% of 80 million	**33.6m**
Core and satellite	80% index, 20% active	**26.88m / 6.72m**
Blended fee	0.8 × 0.05% + 0.2 × 0.80%	**0.20%**
Fee in money	0.20% of 33.6 million	**67,200**
Active risk	20% × 5% satellite risk	**1.0%**

All active: 268,800 a year; all index: 16,800

IN THE LESSON

- Apply it to the equity sleeve of mix C.
- Equities are forty two per cent of eighty million, which is thirty three point six million.
- Put eighty per cent in a passive core, twenty six point eight eight million, and twenty per cent in an active satellite, six point seven two million.
- The core charges zero point zero five per cent and the satellite zero point eight zero per cent, so the blended fee is zero point two zero per cent, or sixty seven thousand two hundred a year.
- If the satellite has tracking error of five per cent, active risk for the sleeve is twenty per cent of five per cent, which is one point zero per cent.
- For comparison, all active would cost two hundred and sixty eight thousand eight hundred a year and all index sixteen thousand eight hundred.
- The structure buys active exposure where the board believes in it, at a fraction of the cost.

23 Which vehicle delivers which mandate

Match the vehicle to the job

Mandate	Vehicle
Cheap broad exposure	Index fund or ETF
Custom rules, own holdings	Separate account
Quick exposure or overlay	Futures or swap
Private assets	Limited partnership

IN THE LESSON

- For cheap, broad exposure to a market, an index fund or an exchange traded fund is the simplest.
- When the investor wants custom rules, such as excluding certain companies, or direct ownership of the holdings for tax reasons, a separately managed account fits.
- For quick exposure, or an overlay that changes risk without selling holdings, use futures or total return swaps.
- For private assets, such as unlisted real estate or infrastructure, there is no index to copy, so the route is a limited partnership run by an active manager.

24 Why a portfolio drifts

- Markets drag the mix away from policy
- Winners grow into a bigger share of risk
- Rebalancing restores the policy risk level
- It costs money and means selling winners
- Leverage speeds drift; illiquid assets resist trades

IN THE LESSON

- Picture a garden left alone: the strongest plant crowds out the rest.
- A portfolio behaves the same way.
- After a rally in shares, the equity slice has grown, so the portfolio carries more risk than the policy intended.
- Rebalancing means trading back toward the policy mix to restore its risk profile.
- It is not free: there are transaction costs, possibly taxes, and it means selling what has just done best, which feels wrong.
- So the strategic questions are how often to rebalance, how far to go and what should trigger a trade.
- Leverage makes a portfolio drift faster, and illiquid assets are hard to trade at all.
- Doing nothing is not neutral.
- It is a decision to let the risk drift.

25 Example 8: a year of drift

Equities +30%, bonds +2%, real estate +5%, cash flat

Equities	33.6m × 1.30	**43.68m**
Everything else	28.56 + 10.08 + 8.80	**47.44m**
New total	43.68 + 47.44	**91.12m**
Equity weight	43.68 ÷ 91.12	**47.9%**
Policy corridor	42% ± 5 points: 37 to 47	**breached**

IN THE LESSON

- Back to the foundation.
- Over the year, equities rise thirty per cent, bonds two per cent, real estate five per cent, and cash stays the same.
- Equities start at thirty three point six million, so they become forty three point six eight million.
- Bonds, real estate and cash are now worth twenty eight point five six plus ten point zero eight plus eight point eight zero, which is forty seven point four four million.
- The new total is ninety one point one two million, so the equity weight is forty three point six eight divided by ninety one point one two, which is forty seven point nine per cent.
- Ines had set a corridor of five points either side of the forty two per cent target, that is thirty seven per cent to forty seven per cent.
- The weight is outside it, and the portfolio is riskier than the trustees chose.

26 Drift against the corridor

Chart: Equity weight (%) vs Time (months)

- Upper limit 47%
- Target 42%
- Lower limit 37%
- 47.9%

IN THE LESSON

- Here is the same story as a picture.
- Along the bottom is time in months.
- Up the side is the equity weight in per cent.
- The three horizontal lines are the policy: the upper limit at forty seven per cent, the target at forty two per cent and the lower limit at thirty seven per cent.
- The rising curve is the equity weight.
- It starts at the target and creeps upward as shares outperform.
- By the end of the year it has crossed the upper limit and reached forty seven point nine per cent.
- A corridor rule waits for that crossing before it trades.
- A calendar rule would trade on set dates, whether or not the curve was near a limit.

27 Calendar, corridor or both

When to trade, and how far

Method	Trades when
Calendar	On fixed dates
Corridor	A weight leaves its band
Both combined	On dates, if outside
Full or partial	All or part-way back

IN THE LESSON

- Now the rules for when and how far to trade.
- Calendar rebalancing trades on fixed dates, say every quarter.
- It is simple, but it may trade when nothing has moved or wait through a big move.
- Corridor rebalancing, also called percentage range rebalancing, trades only when a weight leaves its band.
- It reacts to real drift but needs constant monitoring.
- Many investors combine them: check on set dates, and trade only if a band is breached.
- Then comes how far to go.
- A full rebalance returns exactly to target.
- A partial one moves only part of the way back, which costs less but leaves some drift in place.

28 Example 9: full or part-way?

Equities 43.68m of 91.12m; cost 0.10% of value traded

Full rebalance to 42%	sell 43.68m − 38.27m	**5.41m**
Part-way, to 44.5%	sell 43.68m − 40.55m	**3.13m**
Cost of full	10.82m traded × 0.10%	**10,819**
Cost of part-way	6.26m traded × 0.10%	**6,263**
Risk left	equities 44.5% vs 42%	**+2.5 pts**

IN THE LESSON

- Back to the breach.
- A full rebalance takes equities to forty two per cent of ninety one point one two million, which is thirty eight point two seven million, so Ines sells forty three point six eight minus thirty eight point two seven, which is five point four one million.
- A partial rebalance goes a bit more than halfway back, to forty four point five per cent.
- That is forty point five five million, so the sale is three point one three million.
- Assume trading costs zero point one zero per cent of the value traded.
- The full trade moves ten point eight two million in all, costing ten thousand eight hundred and nineteen.
- The partial trade moves six point two six million, costing six thousand two hundred and sixty three.
- The saving is real, but equities stay two point five points above target.
- For a taxable investor, capital gains tax on shares sold would push further toward the partial route.

29 What sets the corridor width

Each factor, and what it does to the width

Factor	Corridor
Higher trading costs	Wider
Higher risk tolerance	Wider
More correlated with the rest	Wider
Higher volatility	Narrower

IN THE LESSON

- How wide should each corridor be?
- The width trades off the cost of trading against the cost of drifting.
- Higher transaction costs make trading less attractive, so the corridor should be wider.
- A higher risk tolerance can live with more drift, so wider again.
- An asset that is highly correlated with the rest of the portfolio can drift without changing overall risk much, so wider again.
- But a more volatile asset moves away from its target faster, so its corridor should be narrower.
- Wider bands save costs; narrower bands hold risk closer to policy.

30 Mistakes in implementing and rebalancing

- Active risk bought in an efficient market
- Fees and tracking error ignored
- No rebalancing called neutral
- Trading by calendar whatever the cost

IN THE LESSON

- Four traps to finish the lesson.
- First, buying active management in a highly efficient market with no evidence that the added risk will be rewarded.
- Second, ignoring fees and tracking error when comparing vehicles, so that a cheap looking active fund turns out to cost far more than an index fund.
- Third, treating no rebalancing as neutral.
- After a rally an untouched portfolio holds more risk than the policy allows, and that is a decision.
- Fourth, rebalancing on the calendar alone, whatever the cost, when a band would trade only after a real drift.

31 Recap: the lesson in four lines

$U = E(R) - \frac{1}{2}\lambda\sigma^2$
Market weight = value ÷ total
Blended fee = Σ weight × fee

Screen first	Limits first, then least risk
Market start	Every tilt has a reason
Active only if paid	Net of fees and tracking error
Rebalance by rule	Weigh cost, tax, risk, views

IN THE LESSON

- To propose an allocation, read the policy statement, pick the approach, drop every mix that breaks a limit, and take the least risk that earns enough, or the highest utility.
- Defend it by tying each feature to a client fact.
- The global market portfolio is the neutral start.
- It needs no forecasts, and every tilt away from it needs a reason and a size.
- In implementation, be active only where the tests say it pays, net of fees and tracking error, and match the vehicle to the mandate.
- In rebalancing, use a rule, a calendar, a corridor or both, and weigh cost, taxes, risk and your beliefs.

32 Try three quick questions

1. Return 8%, volatility 10%, risk aversion 3. Utility?
   Answer: $8\% - \frac{1}{2} \times 3 \times 0.10^2 = 8\% - 1.5\% = 6.5\%$.
2. 50m: 80% index at 0.05%, 20% active at 1.00%. Fee?
   Answer: $0.8 \times 0.05\% + 0.2 \times 1.00\% = 0.24\%$.
3. Equities 60m, other 45m; corridor 45% to 55%. Trade?
   Answer: 60 ÷ 105 = 57.1%: above 55%, rebalance.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- A mix has a return of eight per cent, volatility of ten per cent and risk aversion of three.
- What is its utility?
- The penalty is a half times three times zero point one squared, which is one point five points, so utility is six point five per cent.
- Question two.
- Of fifty million, eighty per cent is in an index at zero point zero five per cent and twenty per cent with an active manager at one point zero zero per cent.
- What is the blended fee?
- It is zero point eight times zero point zero five plus zero point two times one point zero zero, which is zero point two four per cent.
- Question three.
- Equities are sixty million, everything else forty five million, and the corridor is forty five per cent to fifty five per cent.
- Do you trade?
- The weight is sixty over one hundred and five which is fifty seven point one per cent, so yes, rebalance.

Summary notes for the Charta whiteboard lesson. Figures are from the lesson's made-up examples.