Currency hedging: ratios, costs and cross-hedges

Derivatives and Risk Management

1 A story: the sailor and the wind

- A position is only as good as its reason
- Each strategy watches its own trigger
- When the trigger moves, the position moves
- Speed matters most for carry

IN THE LESSON

- Think of a sailor who sets a course by the wind.
- As long as the wind holds, the course is sound.
- The moment it shifts, a good sailor changes the sails, because the reason for the course has gone.
- An active currency position works the same way.
- Maya Ferreira opens each position for a reason, and every strategy has its own kind of wind.
- When the driver shifts, the position should shift too.
- In the exam, name the driver, say which way it moved, and say what the trade should do.

2 Four strategies, four triggers

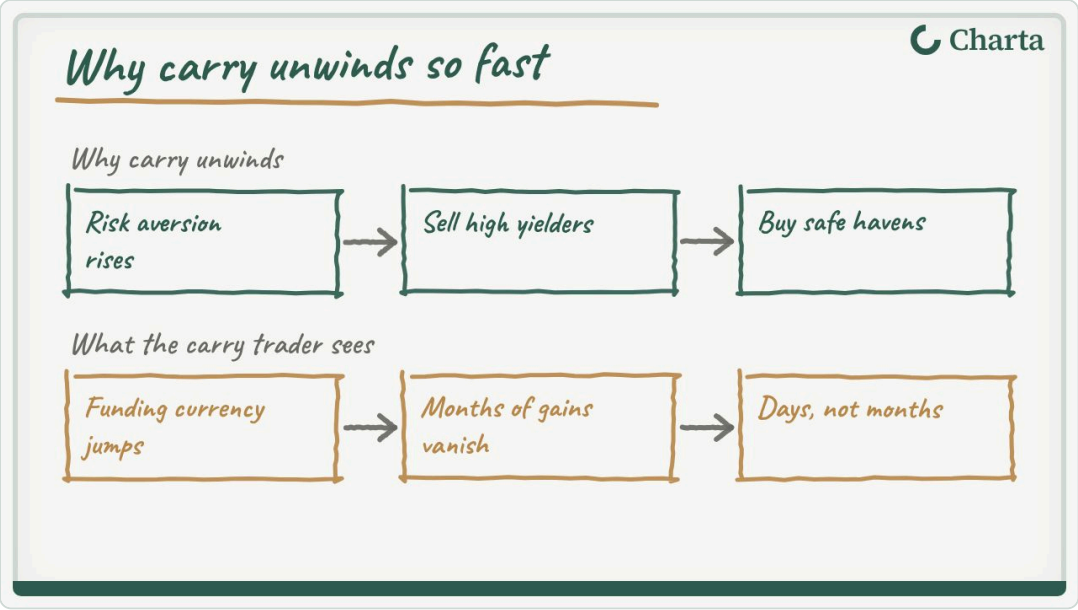
What moves each position

Strategy and trigger	Response
Fundamentals: fair value revised	Move target
Carry: gap narrows, volatility up	Cut
Technical: trend breaks	Flip signal
Volatility: implied above forecast	Sell options

IN THE LESSON

- Here are the four strategies and the trigger each one watches.
- First, fundamentals.
- Maya has a view of the fair value of a currency.
- If higher real interest rates, a wider current account deficit, or a change in expected central bank policy moves that fair value, the position follows.
- Second, carry.
- A carry trade borrows a low yielding currency and lends a high yielding one.
- When the gap narrows and volatility rises, the reward shrinks and the danger grows, so she cuts.
- Third, technical trading follows trends, so when a trend breaks or a moving average crosses, the signal flips.
- Fourth, volatility.
- When implied volatility, the price the options market charges, is above her forecast of what will really happen, she sells options.
- When it is below, she buys them.

3 Why carry unwinds so fast



IN THE LESSON

- Carry can fall apart fast.
- Read the top row from left to right.
- When investors become more afraid, risk aversion rises.
- They sell the high yielding currencies they were holding.
- And they buy safe haven currencies, the ones people run to in a storm.
- Now the bottom row, what the trader sees.
- The funding currency she borrowed jumps in value, months of gains vanish, and it happens in days.
- It feeds on itself, because everyone in the trade reaches the same conclusion at the same time.
- So the signal to cut is a narrower gap together with rising volatility, and the time to act is early.

4 Example 1: reading the carry signal

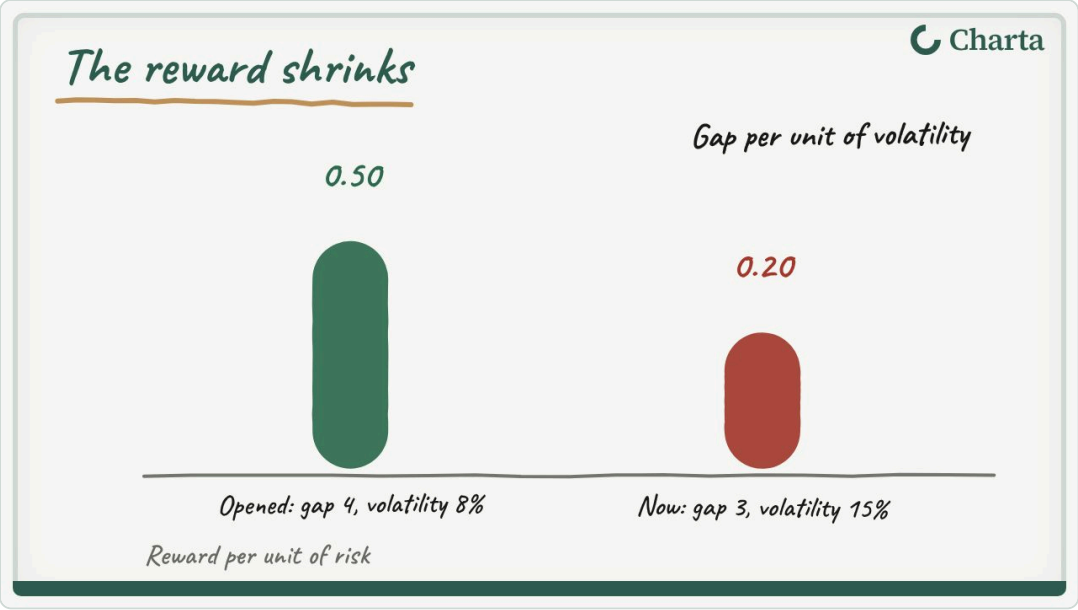
Carry trade: yield gap 4 points; implied volatility 8%

Reward per unit of risk, before	4 ÷ 8	**0.50**
After: gap 3, volatility 15%	3 ÷ 15	**0.20**
Reward left	0.20 ÷ 0.50	**40%**
Carry decision		**Cut**
Implied 12%, forecast 9%		**Sell options**

IN THE LESSON

- Let us put numbers on the carry signal.
- Maya holds a carry trade with a yield gap of four points.
- The implied volatility of the currency pair is eight per cent.
- A simple gauge divides the gap by the volatility.
- Four over eight is point five zero, the reward for each unit of risk.
- A month later the gap has narrowed to three points and volatility has jumped to fifteen per cent.
- Three over fifteen is point two zero.
- Divide point two zero by point five zero and only forty per cent of the reward per unit of risk is left.
- Both drivers moved against her, so she cuts.
- On another pair, implied volatility is twelve per cent but her forecast of real volatility is nine per cent.
- The options look expensive, so she sells options.

5 The reward shrinks



IN THE LESSON

- Here is that change as a picture.
- The vertical axis is the yield gap for each unit of volatility, so it measures the reward for the risk taken.
- The first bar is the position when Maya opened it: point five zero, with a gap of four and volatility of eight per cent.
- The second bar is the position a month later: point two zero, with a gap of three and volatility of fifteen per cent.
- The bar has shrunk to well under half, and it was mostly the jump in volatility that did the damage.
- Carry managers watch fear as closely as interest rates.

6 Example 2: the cost of being slow

Carry position 20m euros; the gap pays 4% a year

Carry income, six months	20m × 4% × ½	**+0.40m**
Three-day move against, 3%	20m × 3%	**−0.60m**
Net if held	0.40 − 0.60	**−0.20m**
Net if cut to 8m first	0.40 − 8m × 3%	**+0.16m**
Worth of acting early	0.16 + 0.20	**0.36m**

IN THE LESSON

- Speed matters because losses arrive faster than gains.
- Here is the arithmetic.
- Maya's carry position is twenty million euros and the gap pays four per cent a year.
- Over six months that is point four zero million.
- Now suppose fear spikes and the currency falls three per cent in just three days.
- Three per cent of twenty million is point six zero million.
- Held through the fall, the position is down point two zero million.
- Suppose instead she had cut the position to eight million at the first signal.
- The same fall costs far less, and she keeps point one six.
- Acting early is worth point three six million.
- Forward points, the gap between the forward rate and spot, change too, and that changes what her hedges cost to roll.

7 A story: the thermostat

- A hedge sells foreign currency forward
- The assets move, so the ratio drifts
- A tolerance band says when to act
- A foreign exchange swap rolls and resizes at once

IN THE LESSON

- Picture a thermostat.
- You set a target temperature, and the heating switches on whenever the room drifts too far from it.
- A currency hedge needs the same care.
- A forward contract is a promise to exchange one currency for another at a fixed rate on a future date.
- To hedge, Linden Bay sells the foreign currency forward in an amount equal to the share of its foreign assets it wants protected.
- The hedge ratio is that forward amount divided by the value of the assets.
- But markets move, so the assets change in value and the ratio drifts away from the target.
- Maya must resize the hedge, roll it when it expires, and find the cash each settlement needs.
- A foreign exchange swap can roll and resize in one trade.

8 The hedge ratio and the trade

Hedge ratio = forward sold ÷ foreign assets
Trade needed = target ratio × assets − forward sold

Hedge ratio	Forward ÷ assets
Forward sold	Amount already sold
Foreign assets	Value today, foreign units
Target ratio	Policy, often 100%
Trade needed	Positive: sell more forward

IN THE LESSON

- Two short formulas run the whole process.
- The hedge ratio is the forward amount sold divided by the value of the foreign assets.
- One hundred per cent is a full hedge.
- Above it, the fund hedges currency it does not own, which is really a bet.
- The second formula tells you what to trade.
- The trade needed is the target ratio times today's asset value, minus the forward already sold.
- If the answer is positive, sell more forward.
- If it is negative, buy some back.
- Always use today's asset value, not the value when the hedge was put on.

9 Example 3: the hedge drifts

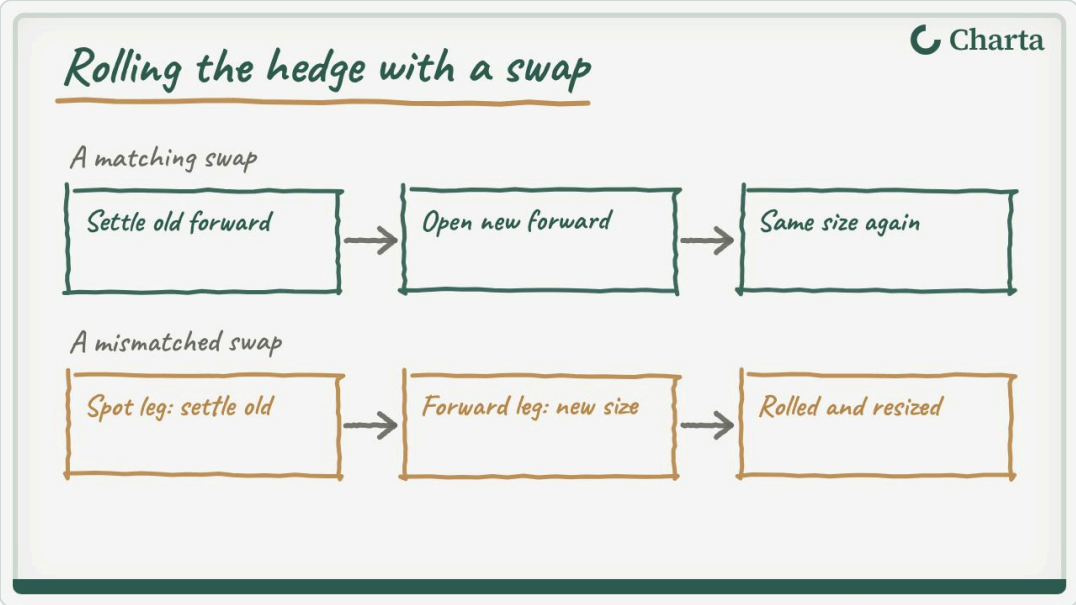
Linden Bay: 50m of foreign shares, 50m sold forward

Shares rise to		**54m**
Hedge ratio now	50 ÷ 54	**92.6%**
Tolerance band	95% to 105%	**Outside**
Extra forward to sell	1.00 × 54 − 50	**4m**
Ratio after the trade	54 ÷ 54	**100%**

IN THE LESSON

- Now an example.
- Linden Bay holds fifty million of foreign shares, quoted in the foreign currency, and has sold fifty million forward.
- The ratio is a full hundred per cent.
- Then the shares rise to fifty four million.
- The hedge ratio is now fifty over fifty four, which is ninety two point six per cent.
- Linden Bay's policy allows a tolerance band of ninety five to one hundred and five per cent, so this is outside the band and Maya must act.
- The trade needed is the target of one times fifty four, minus the fifty already sold, which is four million more sold forward.
- After the trade the ratio is fifty four over fifty four, back to a hundred per cent.
- Why a band?
- Trading after every small move costs money, while never trading lets the hedge drift.

10 Rolling the hedge with a swap



IN THE LESSON

- Next, how the hedge is rolled.
- When a forward matures, two things must happen: the old contract is settled, and a new one is opened.
- A foreign exchange swap does both in one trade.
- It has two legs.
- The spot leg settles the expiring contract.
- The forward leg opens the new one.
- Look at the top row.
- In a matching swap, the spot amount and the forward amount are equal.
- The old forward is settled, a new forward is opened, and the hedge is the same size again.
- Now the bottom row.
- In a mismatched swap, the two legs have different amounts.
- The spot leg settles the old contract in full, but the forward leg is sized to the new target.
- So the hedge is rolled and resized in a single transaction.

11 Example 4: a roll that needs cash

80m hedged at 1.20 euros; shares fall to 72m; spot 1.25

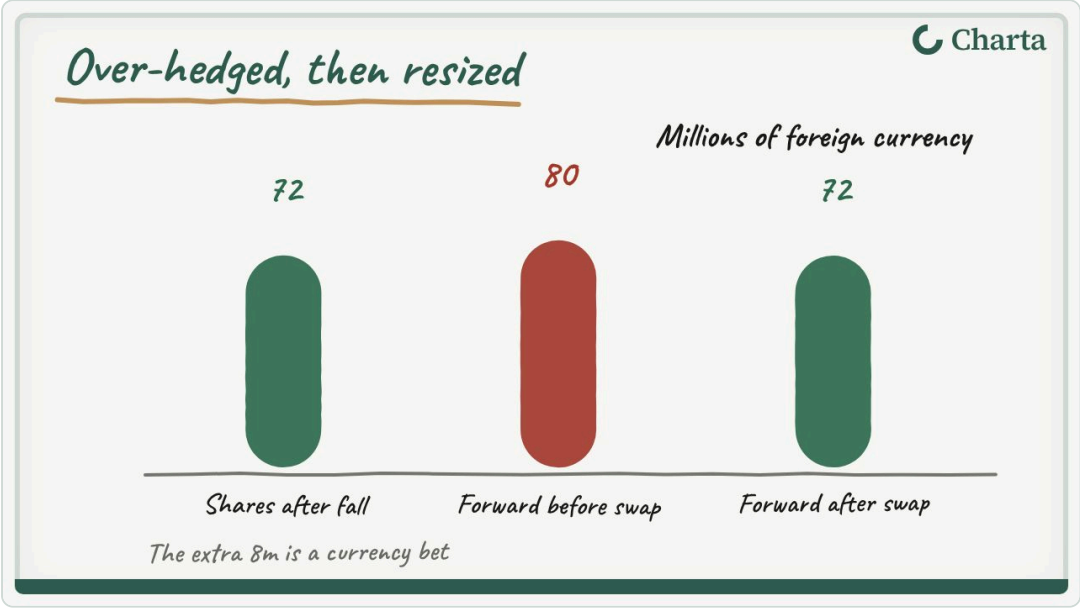
Hedge ratio before the roll	80 ÷ 72	**111%**
Settle old forward	80m × (1.20 − 1.25)	**−4.0m**
Unrealised gain on shares	72m × (1.25 − 1.20)	**+3.6m**
Swap: buy 80m spot, sell 72m	one trade	**Resized**
New hedge ratio	72 ÷ 72	**100%**

Net −0.4m: the 8m over-hedge × 0.05

IN THE LESSON

- Let us run a full roll with numbers.
- Linden Bay had eighty million of foreign shares hedged with a forward sold at one point two zero euros per unit.
- At maturity the shares have fallen to seventy two million and spot is one point two five.
- Eighty over seventy two is a hundred and eleven per cent, so the fund is over hedged.
- Settling the old forward costs eighty million times the difference between one point two zero and one point two five, which is minus four million euros, cash that must be paid now.
- The shares gained three point six million in euro terms, but only on paper.
- The mismatched swap buys eighty million spot and sells seventy two million forward, and the new ratio is a hundred per cent.
- Net, the fund is down point four million, which is the over hedge of eight million times point zero five.
- That is the price of being over hedged.

12 Over-hedged, then resized



IN THE LESSON

- This picture shows the over hedge and the cure.
- The vertical axis is millions of foreign currency.
- The first bar is the shares after their fall: seventy two.
- The second bar is the forward before the swap: eighty.
- It is taller than the shares, which means the fund has sold more currency than it owns.
- That extra eight million is a speculative short position in the currency.
- The third bar is the forward after the mismatched swap: seventy two, matching the shares again.
- The trap is the cash: the loss on the forward is paid now, while the gain on the shares is on paper.
- So Maya needs a liquidity plan to pay settlements when they fall due.

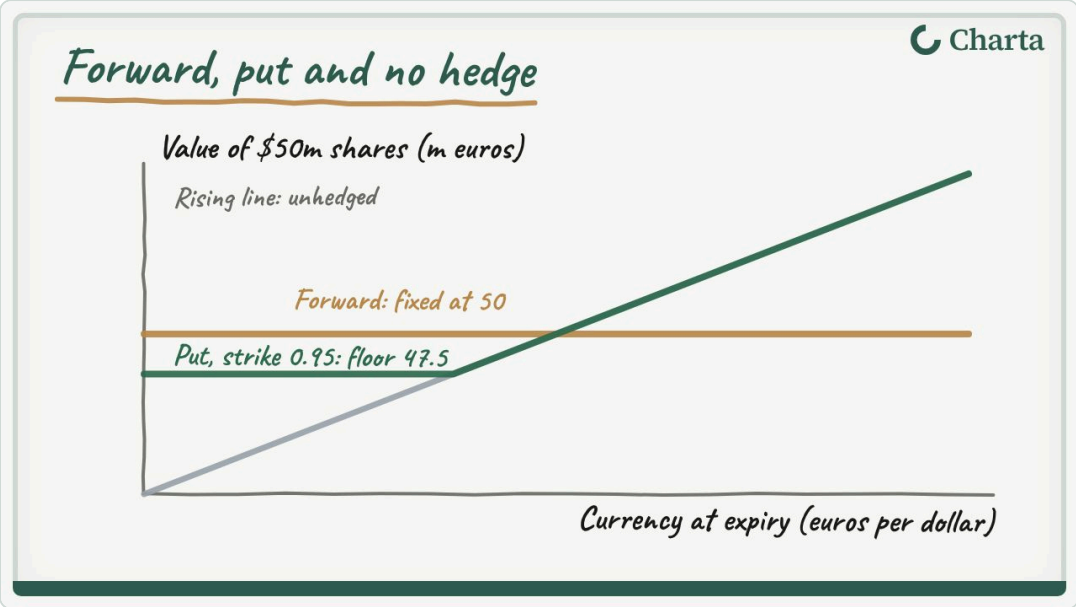
13 A story: insuring the house

- A forward is free upfront but gives up the gains
- A put keeps the gains, for a premium
- Cutting the premium means giving something back
- Give up some cover or some upside, or both

IN THE LESSON

- Hedging with a forward is like insuring a house and handing the insurer any rise in its value.
- A forward costs nothing upfront, but it locks the rate, so Linden Bay gives up every gain if the foreign currency rises.
- An option keeps the upside.
- A put option gives the right to sell the currency at a set price, called the strike, so it sets a floor.
- A call gives the right to buy at the strike.
- The price of an option is its premium, and a plain put can be expensive.
- So Maya has ways to cut the premium.
- Each one works the same way: she gives something back, either some of the protection or some of the upside.
- There is no free lunch.

14 Forward, put and no hedge



IN THE LESSON

- Let us draw it.
- The horizontal axis is the exchange rate at expiry, in euros per dollar.
- The vertical axis is the euro value of fifty million dollars of shares.
- First the flat line, the forward hedge: whatever the dollar does, the value stays at fifty.
- Now the rising line: the shares unhedged, where value moves one for one with the dollar.
- Last, the put.
- Its line is flat at the left, a floor at forty seven point five, set by a strike of point nine five.
- Then it climbs along the unhedged line.
- So the put protects the downside and keeps the upside.
- I have left the premium off the picture.

15 Example 5: pricing the choices

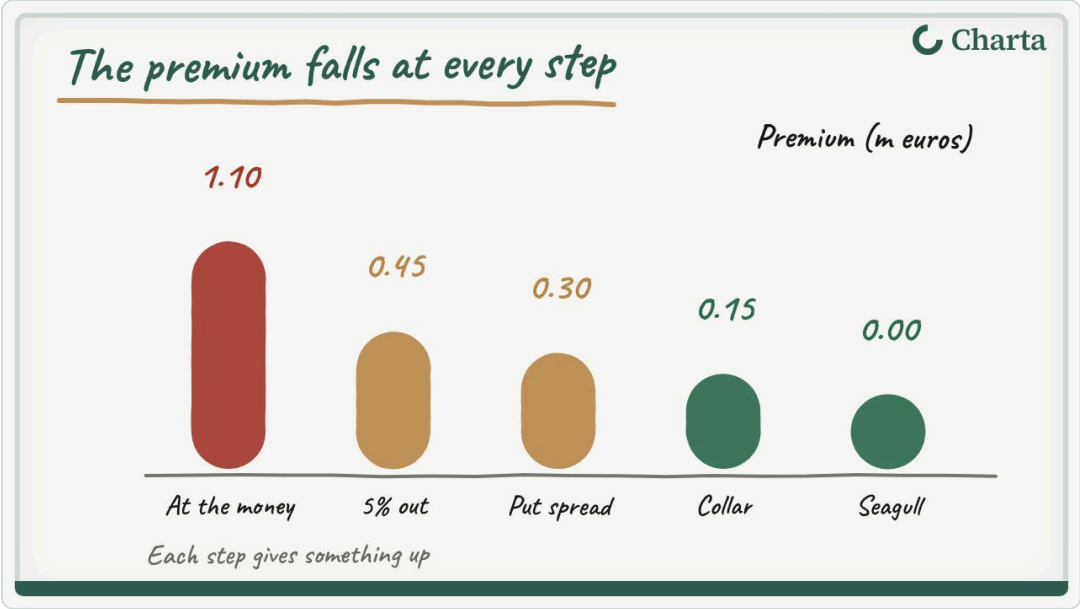
50m, spot 1.00; strikes 0.95 / 0.90 / 1.05

At-the-money put, 2.2%	2.2% × 50m	**1.10m**
Put 5% out of the money, 0.9%	0.9% × 50m	**0.45m**
Put spread: sell put 10% out	(0.9% − 0.3%) × 50m	**0.30m**
Collar: sell call 5% out, 0.6%	(0.9% − 0.6%) × 50m	**0.15m**
Seagull: both sales	(0.9 − 0.3 − 0.6)% × 50m	**0.00m**

IN THE LESSON

- Now price the choices.
- Linden Bay holds fifty million dollars of shares, spot is one euro per dollar, and it wants protection.
- The premiums are illustrative.
- An at the money put, with a strike at one, costs two point two per cent, which on fifty million is one point one zero million.
- A put five per cent out of the money costs point nine per cent, point four five million, but the first five per cent of any fall is the fund's own, like a deductible.
- A put spread also sells a put ten per cent out of the money for point three per cent, so the net is point three zero million.
- A collar instead sells a call five per cent out of the money for point six per cent, so the net is point one five million.
- The seagull does both sales, and the cost nets out to nothing.

16 The premium falls at every step



IN THE LESSON

- Here are those premiums as bars.
- The vertical axis is the premium in millions of euros.
- Read from left to right.
- The at the money put is the tallest, one point one zero.
- The put five per cent out of the money is point four five, less than half.
- The put spread is point three zero.
- The collar is point one five.
- And the seagull is zero.
- The cost falls at each step, and each step down is paid for with more risk or less upside.
- A forward costs nothing upfront either, but it gives up all the upside.

17 What each saving gives up

Cheaper hedge, and the price paid

Structure	Gives up
Put 5% out of the money	First 5% of a fall
Put spread	Cover below 0.90
Collar	Gains above 1.05
Seagull	Both of these

IN THE LESSON

- This table says what each saving gives up.
- The put that is five per cent out of the money leaves the first five per cent of a fall uncovered, the deductible.
- The put spread stops paying below its lower strike of point nine zero, so a bigger fall is the fund's problem again.
- The collar gives up gains above the strike of the call it sold, one point zero five.
- The seagull gives up both, the deep cover and the high gains.
- Two more levers sit outside the table.
- Barrier options switch on or off at a set rate, so they cost less because they might never pay.
- And a manager can deliberately over or under hedge.
- The client's view decides: a fear of a small fall suits a put spread, no hope of a rally suits a collar, and both views on a tight budget suit a seagull.

18 Example 6: testing the seagull

Buy put 0.95, sell put 0.90, sell call 1.05 on 50m

No hedge, dollar at 0.85	50m × 0.85	**42.5**
Seagull, dollar at 0.92	46.0 + 1.5	**47.5**
Seagull, dollar at 0.85	42.5 + 5.0 − 2.5	**45.0**
Seagull, dollar at 1.10	55.0 − 2.5	**52.5**
No hedge, dollar at 1.10	50m × 1.10	**55.0**

Net premium assumed zero; values in m euros

IN THE LESSON

- Let us test the seagull.
- Linden Bay buys a put at point nine five, sells a put at point nine zero and sells a call at one point zero five, all on fifty million dollars, and we assume the premiums net to zero.
- With no hedge, a fall to point eight five leaves the shares at forty two point five million euros.
- Now the seagull.
- If the dollar ends at point nine two, inside the protected zone, the shares are worth forty six million and the put pays one point five, so forty seven point five.
- Below point nine zero, protection stops.
- At point eight five the put pays five, the sold put costs two point five, and the fund ends at forty five million.
- Better than unhedged, but not fully protected.
- If the dollar rallies to one point one zero, the sold call costs two point five, so the fund keeps fifty two point five, not fifty five.
- It paid with its gains.

19 Mistakes to avoid so far

- Holding carry while volatility and fear rise
- Ignoring drift, or the cash a settlement needs
- Over-trading the hedge and paying for it
- Calling a cheaper hedge free of any cost
- Selling a call for a client who wants the upside

IN THE LESSON

- Let us collect the mistakes from the first three topics.
- One: holding a carry trade while volatility and fear are rising, because the unwind is fast.
- Two: ignoring drift in the hedge ratio, or forgetting that a forward settlement is cash that must be paid long before the gain on the assets is realised.
- Three: trading the hedge so often that the costs eat the benefit.
- Four: calling a cheaper hedge free.
- Every cut in premium is paid for with cover or upside.
- Five: selling a call for a client who wants to keep the upside, which defeats the purpose of using options at all.

20 A story: more than one currency

- Hedging one for one is not always best
- A cross-hedge uses a correlated stand-in currency
- A macro-hedge covers a basket in one trade
- The minimum-variance ratio is a regression slope

IN THE LESSON

- Hedging one for one is the obvious way to cover a foreign asset, but it is not always the best, or even possible.
- Suppose Linden Bay owns assets in several countries.
- Several problems appear.
- First, some currencies are illiquid or restricted, so there is no good forward.
- A cross hedge uses a different, correlated currency as a stand in.
- It works, but the two currencies will not move exactly together, and that leftover risk is called basis risk.
- Second, hedging each currency separately is costly and clumsy.
- A macro hedge protects the whole portfolio against a broad risk, such as a basket of currencies falling, in one trade.
- Third, the best amount to hedge may not equal the asset.
- The minimum variance hedge ratio finds the amount that cuts risk the most.

21 The minimum-variance hedge ratio

$h = \rho \times \sigma(RDC) \div \sigma(RFX)$
$\text{Basis risk} = \sigma \times \sqrt{(1 - \rho^2)}$

Hedge ratio h	Share of exposure to hedge
Correlation	Between the two returns
Asset volatility	Return in home currency
Currency volatility	Return of the exchange rate
Basis risk	Risk left after the hedge

IN THE LESSON

- The minimum variance hedge ratio is the slope you get by regressing the foreign asset's return in your home currency on the currency's return.
- In symbols, h equals rho, the correlation between the two, times the volatility of the asset's home currency return, divided by the volatility of the currency's return.
- Why is it not always one?
- If the currency simply passes through, the slope is one.
- But if the foreign market tends to rise when its currency falls, part of the currency risk is cancelled inside the asset, and the ratio is below one.
- If local returns reinforce the currency, it can exceed one.
- The same correlation idea gives the leftover risk of a cross hedge: the volatility of the exposure times the square root of one minus rho squared.
- That is the risk no hedge removes.

22 Example 7: the ratio and its trap

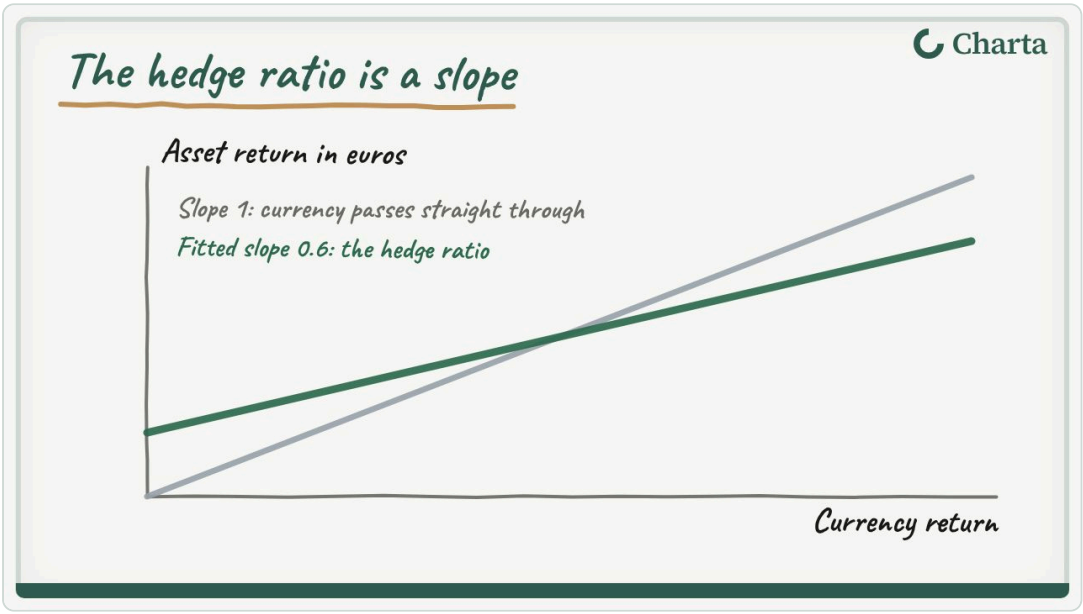
Linden Bay: 50m foreign asset; vol 12%; currency vol 10%

Correlation 0.5: hedge ratio	0.5 × 12 ÷ 10	**0.60**
Amount sold forward	0.60 × 50m	**30m**
Correlation drifts to 0.8	0.8 × 12 ÷ 10	**0.96**
Amount sold forward now	0.96 × 50m	**48m**
Reinforcing case, vols 15 and 10	0.8 × 15 ÷ 10	**1.20**

IN THE LESSON

- Now numbers.
- Linden Bay holds fifty million of a foreign asset.
- Its home currency return has a volatility of twelve per cent, the currency's volatility is ten per cent, and the correlation is point five.
- The hedge ratio is point five times twelve over ten, point six zero.
- So Maya sells thirty million forward, not fifty, because part of the currency risk is offset inside the asset.
- Now the trap.
- Correlations drift.
- If it rises to point eight, the ratio becomes point nine six, and the hedge grows to forty eight million.
- Same asset, very different hedge.
- So the estimate is a starting point, not an order.
- Last, a reinforcing case, with asset volatility of fifteen per cent, the currency at ten and correlation point eight: the ratio is one point two zero, which is above a full hedge.

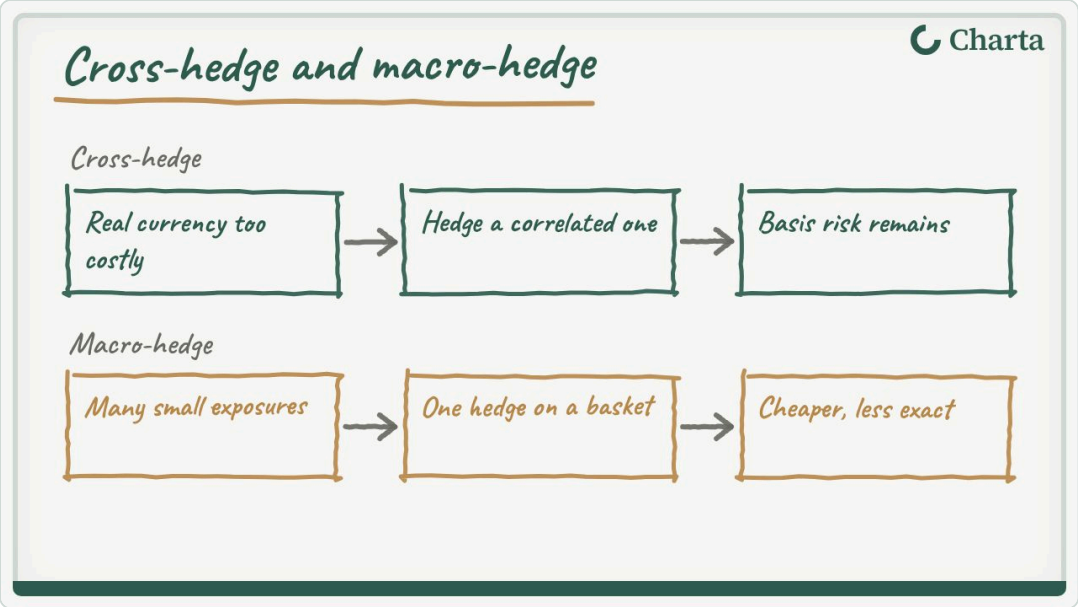
23 The hedge ratio is a slope



IN THE LESSON

- Here is the same idea as a picture.
- The horizontal axis is the return on the currency.
- The vertical axis is the return on the asset, in euros.
- First the steeper line, with a slope of one.
- If the asset's local value never moved, every currency move would pass straight into the euro return, and the line would have a slope of one.
- Next the flatter line, the fitted regression.
- Here the asset's local return tends to rise when the currency falls, and it offsets part of the move, so the slope is point six.
- That slope is the minimum variance hedge ratio.
- A full hedge at a ratio of one would over hedge.

24 Cross-hedge and macro-hedge



IN THE LESSON

- Two other tools are about cost and practicality.
- Read the top row first.
- A cross hedge starts when the real currency is too costly or impossible to hedge.
- So Maya hedges a different currency that tends to move with it.
- The price she pays is basis risk, because the stand in will not track the real currency exactly.
- Now the bottom row.
- A macro hedge starts when there are many small exposures.
- Instead of hedging each, she puts one hedge on a basket, or on a broad risk such as a general flight from risk.
- It is cheaper and simpler, but individual exposures are left unmatched.
- Both tools trade accuracy for cost.

25 Example 8: sizing both hedges

K: 20m, hedged with C, correlation 0.8. Macro: forwards 0.3%, basket 0.2%

Ratio: K vol 12, C vol 8	0.8 × 12 ÷ 8	**1.20**
Amount sold in C	1.20 × 20m	**24m**
Risk without the hedge		**12.0%**
Basis risk left	12 × √(1 − 0.64)	**7.2%**
Macro: 30m, 3 forwards or 1 basket	0.09m vs 0.06m	**Saves 0.03m**

IN THE LESSON

- Let us size both.
- Linden Bay has twenty million in currency K, which cannot be hedged cheaply.
- Currency C is liquid and its correlation with K is point eight.
- K has a volatility of twelve per cent and C of eight.
- The ratio is point eight times twelve over eight, one point two zero, so Maya sells twenty four million of C.
- Unhedged risk is twelve per cent.
- After the cross hedge, the leftover basis risk is twelve times the square root of one minus point six four, which is seven point two per cent.
- So the hedge removes less than half the risk.
- Now the macro hedge.
- Thirty million is spread across three currencies.
- Three separate forwards at point three per cent cost point zero nine million, while one basket hedge at point two per cent costs point zero six, a saving of point zero three for rougher protection.

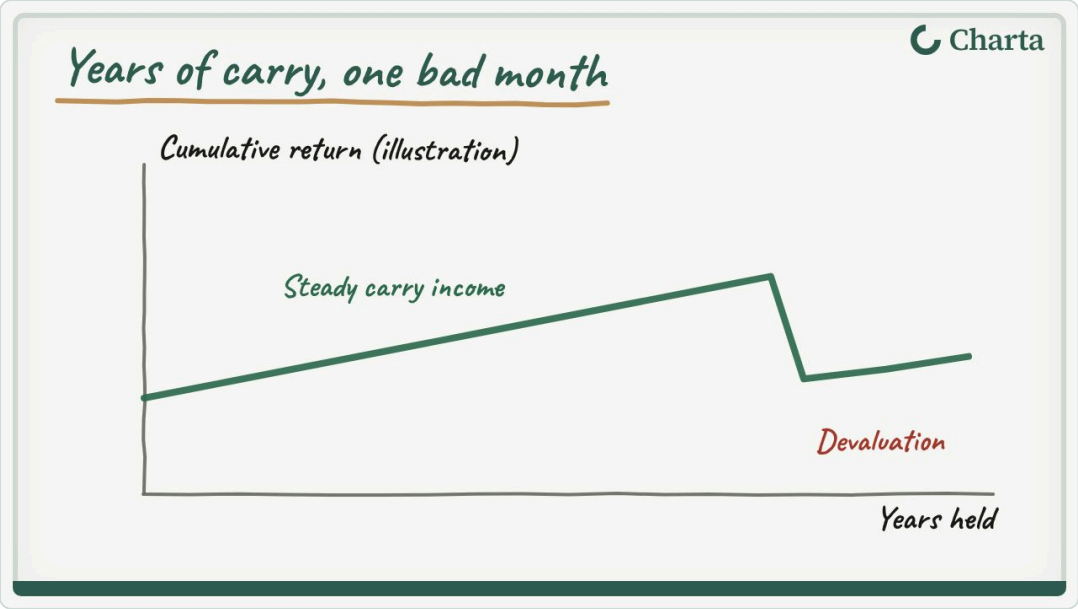
26 A story: the mountain road

- Emerging currencies pay well for long stretches
- Trading costs more; liquidity vanishes in stress
- Calm spells end in sudden devaluations
- In a crisis they all fall together
- Capital controls force cash-settled hedges

IN THE LESSON

- Emerging market currencies are like a mountain road with a lovely view.
- Most of the journey is smooth, and then a sudden bend arrives.
- They often pay high interest, so holding them earns steady carry.
- But the difficulties arrive together.
- Trading costs more, with wider bid ask spreads, which are the gaps between the buying and selling prices, and liquidity can vanish just when the hedge is needed.
- Returns are fat tailed and negatively skewed: long calm spells broken by sudden devaluations, when a peg breaks or a government steps in.
- In a crisis these currencies fall together, so diversification fails.
- And capital controls often block delivery, so hedges must be settled in cash.

27 Years of carry, one bad month



IN THE LESSON

- Here is the shape of that risk.
- The horizontal axis is the years held.
- The vertical axis is the cumulative return, an illustration and not real data.
- Follow the line from the left.
- For years it climbs steadily, as high interest rates and a managed exchange rate pay a small gain each month.
- Then, in one step, most of it is gone.
- That is a devaluation, after a peg breaks or a government intervenes.
- Now imagine fitting a risk model to the calm stretch on the left, assuming a normal distribution.
- It would see low volatility and a reliable gain, and it would put almost no probability on the fall that decides the whole outcome.
- Normal models and calm period data understate losses.

28 Example 9: a hedge that settles in cash

Bond 100m local units; spot 20 per euro; NDF at 20

Euro value at the start	100 ÷ 20	**5.00m**
NDF gain at fixing 24	100 ÷ 20 − 100 ÷ 24	**0.83m**
Bond sold at onshore rate 25	100 ÷ 25	**4.00m**
Hedged total	4.00 + 0.83	**4.83m**
Basis loss	5.00 − 4.83	**0.17m**

IN THE LESSON

- When capital controls block delivery, the fund uses a non deliverable forward, or N D F.
- No currency changes hands.
- At maturity it is settled in cash in euros, at a fixing rate.
- Linden Bay holds a bond worth one hundred million local units.
- Spot is twenty per euro, so the bond is worth five million euros.
- It hedges with an N D F at twenty.
- The currency is devalued.
- The offshore fixing is twenty four, so the N D F pays one hundred over twenty, minus one hundred over twenty four, which is point eight three million.
- But the bond can only be sold onshore at twenty five, giving four million.
- The hedged total is four point eight three million.
- Against five, the fund lost point one seven million on a position it thought was hedged.
- That gap is basis risk between the fixing and the onshore rate.

29 Example 10: diversification fails

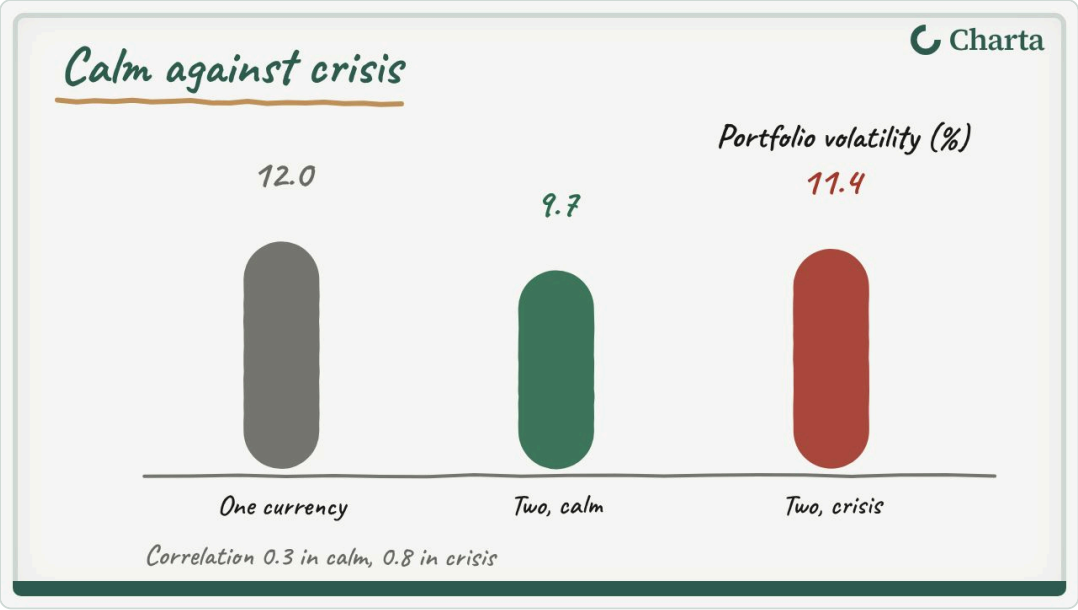
Two currencies, half each, volatility 12% each

One currency alone		**12.0%**
Two, correlation 0.3	12 × √((1 + 0.3) ÷ 2)	**9.7%**
Two, correlation 0.8	12 × √((1 + 0.8) ÷ 2)	**11.4%**
Diversification lost	11.4 − 9.7	**1.7 points**

IN THE LESSON

- Diversification is the other casualty.
- Suppose Linden Bay holds two emerging currencies, half and half, each with a volatility of twelve per cent.
- For equal weights and equal volatilities, the portfolio volatility is twelve times the square root of one plus rho, over two.
- In calm times the correlation is point three, so volatility is twelve times the square root of one plus point three, all over two: nine point seven per cent.
- In a crisis, correlation jumps to point eight, and the same sum gives eleven point four per cent.
- One currency alone is twelve.
- So the crisis wipes out most of the benefit, one point seven points of it, just when it was needed.

30 Calm against crisis



IN THE LESSON

- Here are those three volatilities as bars.
- The vertical axis is portfolio volatility in per cent.
- The first bar is one currency alone: twelve.
- The second is two currencies in calm times: nine point seven.
- The third is the same two in a crisis: eleven point four, almost back to twelve.
- So the diversification you counted on has gone.
- A model built on calm period data and normal returns will understate the loss.
- Risk managers therefore ask what the correlation looks like on the worst days.

31 Managing it: a defensive playbook

- Stress test with the devaluations history shows
- Size positions smaller than the average return suggests
- Budget for wider spreads and dearer hedges
- Expect basis risk and rule changes on cash-settled hedges
- Do not trust normal models fitted to calm years

IN THE LESSON

- So what should Maya do about all this?
- Five habits.
- First, stress test with devaluations of the size history shows, not the size a normal model allows.
- Second, size positions conservatively, smaller than the average return alone would justify.
- Third, budget for wider spreads, dearer hedges and thinner liquidity in turmoil.
- Fourth, expect basis risk and rule change risk on cash settled forwards, since governments can change how a fixing is set.
- And fifth, do not trust a normal distribution fitted to calm years.
- None of these removes the risk.
- They keep the fund alive to collect the carry later.
- The exam answer is usually defensive.

32 Recap: the lesson in five lines

- Each strategy has a trigger; cut carry fast
- Hedge ratios drift: band, forward, mismatched swap
- Cheaper hedges give up cover or upside
- h = ρ × σ(RDC) ÷ σ(RFX); cross and macro hedges
- Emerging markets: costs, fat tails, NDF basis risk

IN THE LESSON

- Let us pull the lesson together.
- First, each active strategy has its own trigger: revised fair value, a narrower yield gap with rising volatility for carry, a broken trend, and implied against forecast volatility.
- Second, hedge ratios drift, so use a tolerance band, resize with forwards, and roll and resize with a mismatched swap, while funding the cash.
- Third, cheaper hedges give up cover or upside: the put spread, the collar and the seagull.
- Fourth, the minimum variance ratio is rho times asset volatility over currency volatility, a cross hedge uses a correlated stand in with basis risk, and a macro hedge covers a basket.
- Fifth, emerging markets bring wide spreads, fat tails, jumping correlations and cash settled hedges with basis risk.

33 Try three quick questions

1. Shares 60m, forward sold 54m. Hedge ratio? Trade for a full hedge?
   Answer: 54 ÷ 60 = 90%. Sell 6m more forward.
2. 40m held; buy put 0.8%, sell call 0.5%. Net premium?
   Answer: (0.8% − 0.5%) × 40m = 0.12m, paid.
3. Correlation 0.6; asset vol 10%, currency vol 8%. Ratio and amount of 40m?
   Answer: 0.6 × 10 ÷ 8 = 0.75, so sell 30m.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- Linden Bay holds sixty million of foreign shares and has sold fifty four million forward.
- What is the hedge ratio, and what trade restores a full hedge?
- Fifty four over sixty is ninety per cent, so sell six million more forward.
- Question two.
- The fund holds forty million dollars of shares, buys a put for point eight per cent and sells a call for point five per cent.
- What is the net premium?
- The difference is point three per cent of forty million, which is point one two million euros, paid by the fund.
- Question three.
- The correlation is point six, asset volatility is ten per cent and currency volatility is eight per cent.
- What is the ratio, and how much of the forty million is sold forward?
- Point six times ten over eight is point seven five, so sell thirty million.
- Check any you missed, then practise more.