Option payoffs, profit and protection

Derivatives

1 A story: the price lock

- Pay a small fee for a right, not a duty
- Painting locked at $50,000 for a month
- Price rises: use the right and save
- Price falls: walk away, lose only the fee

IN THE LESSON

- Imagine you want to buy a rare painting that a gallery sells for fifty thousand dollars.
- You think it may soon be worth more, but you are not sure.
- So you pay the gallery a small fee, three hundred dollars, for a promise.
- For the next month you may buy the painting for fifty thousand, whatever happens to its price.
- If it jumps to sixty thousand, you use the promise and save ten thousand.
- If it falls to forty, you simply walk away, and you lose only your small fee.
- That promise is an option.
- You pay a fee for a right, not a duty.
- The right is what makes the payoff bend.

2 The language of options

Words to know

Underlying	**the asset, such as a share**
Exercise price, X	the price fixed in the contract
Premium	fee the buyer pays up front
Call or put	right to BUY or to SELL at X
Writer	sells it, owes the duty

IN THE LESSON

- Now the vocabulary, each word defined once.
- An option is a contract that gives its buyer a right but no obligation.
- The underlying is the asset the option is about, such as a share.
- The exercise price, also called the strike and written X, is the fixed price in the contract.
- The premium is the fee the buyer pays up front.
- Expiry is the last day of the contract.
- At Level One we look at options that can be used only at expiry.
- A call gives the right to buy the underlying.
- A put gives the right to sell it.
- The buyer, called the long, holds the right.
- The seller, called the writer or the short, takes on the duty.

3 What a call pays at expiry

Call payoff = max(0, S − X)

Price at expiry, S	Price of the underlying on the day
Exercise price, X	Price you may buy at
Call payoff	Never below zero

IN THE LESSON

- Here is the first formula.
- The payoff of a call at expiry is the larger of zero and S minus X.
- Take it piece by piece.
- S is the price of the underlying on the expiry day.
- X is the exercise price, the price you may buy at.
- If S is above X, the right is valuable: you buy at X and the asset is worth S, so you are ahead by S minus X.
- If S is below X, buying at X would be a bad deal, so you do nothing.
- Nobody can force you.
- That is why the payoff is never negative, and why the formula says the larger of zero and the difference.

4 Example 1: a call at four prices

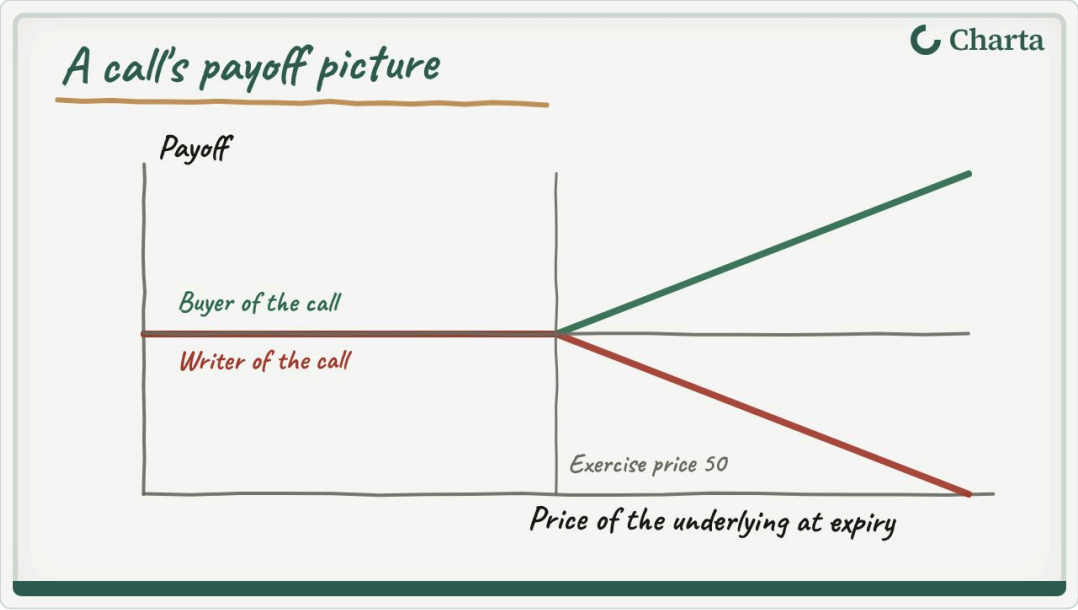
Call on one Brightwell share, exercise price X = $50

Share at $40	max(0, 40 − 50)	**$0**
Share at $50	max(0, 50 − 50)	**$0**
Share at $58	max(0, 58 − 50)	**$8**
Share at $65	max(0, 65 − 50)	**$15**

IN THE LESSON

- Let us meet our running share, Brightwell Foods.
- You hold a call on one share with an exercise price of fifty dollars.
- Test four expiry prices.
- At forty, the share is cheaper in the market than the fifty you would pay, so you abandon the call.
- Payoff zero.
- At fifty exactly, buying at fifty and the market price are the same, so again zero.
- At fifty-eight, you buy at fifty something worth fifty-eight, so the payoff is eight dollars.
- At sixty-five, it is fifteen.
- Notice the pattern.
- Below the exercise price the payoff sits flat on zero.
- Above it, every extra dollar on the share is an extra dollar of payoff.

5 A call's payoff picture



IN THE LESSON

- Here is the picture.
- Across the bottom runs the price of the underlying at expiry.
- Up the side is the payoff.
- The grey line in the middle is zero.
- Now the green line, the call buyer.
- To the left of the exercise price of fifty, it lies flat on zero, because the call is abandoned.
- At fifty it bends and climbs one for one.
- There is no ceiling: a share can rise without limit, so the buyer's payoff can too.
- The red line is the writer, the seller of the call.
- It is the exact mirror image, flat and then falling.
- Whatever the buyer gains, the writer loses, so the two always add up to zero.

6 The writer's side

- Writer's payoff = −max(0, S − X)
- Buyer's payoff + writer's payoff = 0
- Naked call writer: loss unlimited in theory
- Call buyer: worst case is known

IN THE LESSON

- Now the other side of the contract.
- The writer of a call has sold the right, so the writer has the duty.
- If the buyer exercises, the writer must hand over the asset at the exercise price, however high the market price has climbed.
- That is why the writer's payoff is minus the larger of zero and S minus X.
- It is zero when the option is abandoned, and negative otherwise.
- A writer who does not own the asset is called naked, and a naked call writer faces a loss that is, in theory, unlimited, because a price has no top.
- For a call buyer, in contrast, the worst case is bounded and known in advance.

7 Example 2: buyer and writer side by side

Call, X = $50. Payoffs at expiry, before any premium

Buyer, share at $65	max(0, 65 − 50)	**+$15**
Writer, share at $65	−max(0, 65 − 50)	**−$15**
Sum of the two	zero-sum	**$0**
Both, share at $40	abandoned	**$0**

IN THE LESSON

- Example two.
- Same call, exercise price fifty.
- The share finishes at sixty-five.
- The buyer exercises: pays fifty, receives something worth sixty-five, a payoff of fifteen.
- The writer must deliver at fifty what is worth sixty-five, a payoff of minus fifteen.
- Add them up and you get zero.
- Now suppose the share finishes at forty instead.
- The buyer abandons the call.
- Nothing moves, so both payoffs are zero.
- Notice what is missing from these numbers: the fee.
- We have not mentioned the premium yet.
- Payoff is only the cash value of the right on expiry day.
- Who made money overall is a different question, and we come to it shortly.

8 A story: insurance on your car

- Put = the right to SELL at X
- Like insurance: pays when the price falls
- Price stays high: do nothing
- Holder has a right, writer has the duty

IN THE LESSON

- Now flip the story.
- You own a car worth twenty thousand dollars.
- You pay an insurer a yearly fee.
- In return, if the car is wrecked, the insurer pays you up to the agreed value.
- If nothing happens, the fee is gone and you do not mind, because the car is fine.
- That is a put option.
- A put is the right to sell the underlying at the exercise price.
- It gains when the price falls.
- A call is a bet that you want to buy cheaply.
- A put is a way to sell dear.
- And just like the call, the holder has a right, not a duty, so the worst outcome is always avoided by simply doing nothing.

9 What a put pays at expiry

Put payoff = max(0, X − S)

Exercise price, X	Price you may sell at
Price at expiry, S	Price of the underlying on the day
Put payoff	Never below zero

IN THE LESSON

- The put payoff is the mirror of the call formula.
- The payoff of a put at expiry is the larger of zero and X minus S.
- Here X is the exercise price, the price you may sell at, and S is the price of the underlying at expiry.
- If S has fallen below X, you can sell at X something worth only S, so you gain X minus S.
- If S is above X, selling at X would mean selling below the market, which is silly, so the put is abandoned and the payoff is zero.
- Be careful with the order of the letters.
- For a call it is S minus X.
- For a put it is X minus S.
- Mixing these up is the classic slip.

10 Example 3: a put at four prices

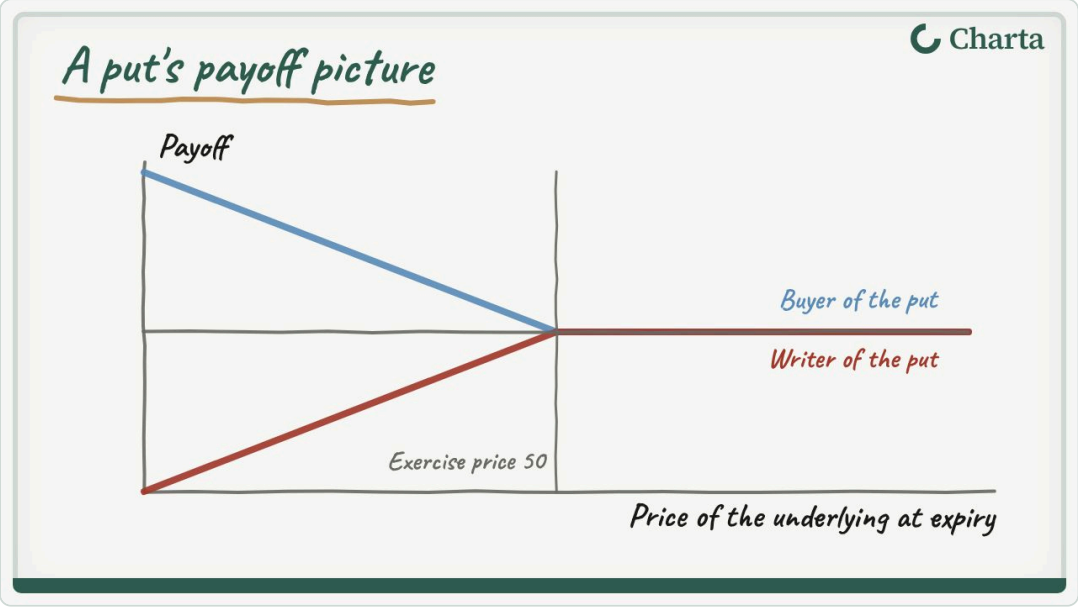
Put on one Brightwell share, exercise price X = $50

Share at $38	max(0, 50 − 38)	**$12**
Share at $55	max(0, 50 − 55)	**$0**
Share at $50	max(0, 50 − 50)	**$0**
Share at $0, the maximum	max(0, 50 − 0)	**$50**

IN THE LESSON

- Example three.
- You hold a put on one Brightwell share with an exercise price of fifty dollars.
- If the share finishes at thirty-eight, you sell at fifty something worth thirty-eight, so the payoff is twelve dollars.
- At fifty, zero.
- At fifty-five, you would not sell below the market, so you abandon it, zero.
- Now the extreme.
- Suppose the company fails and the share is worth nothing.
- Then you sell at fifty something worth zero, and the payoff is fifty dollars.
- That is the most this put can ever pay, because a share cannot fall below zero.
- Compare that with the call, which has no ceiling.
- A put's best case is bounded by the exercise price.

11 A put's payoff picture



IN THE LESSON

- Here is the put picture, with the same axes.
- Price of the underlying at expiry runs along the bottom, and payoff up the side.
- The grey line is zero.
- The blue line is the put buyer.
- To the right of the exercise price of fifty, it lies flat on zero, because the put is abandoned.
- At fifty it bends and rises as the price falls, one dollar of payoff for every dollar of fall.
- It would keep climbing, but only until the price reaches zero, which is off the left edge of this picture.
- The red line is the writer of the put, the mirror image.
- The writer can lose a great deal, but never more than the exercise price.
- The call writer has no such limit.

12 Calls and puts, buyer and writer

Payoff at expiry, before any premium

Long call	**max(0, S − X): no ceiling**
Short call	−max(0, S − X): unlimited loss
Long put	max(0, X − S): at most X
Short put	−max(0, X − S): at most X lost

IN THE LESSON

- Let us collect all four positions in one place, because questions love to mix them.
- The buyer of a call gains when the underlying rises, and the payoff has no ceiling.
- The writer of a call is the mirror, with a loss that is unlimited in theory.
- The buyer of a put gains when the underlying falls, and the best case is bounded by the exercise price, because the price cannot go below zero.
- The writer of a put loses when the underlying falls, and the worst case is also bounded by the exercise price.
- Notice the pattern.
- Buyers never have a negative payoff.
- Writers never have a positive one.
- And in each pair, one side's gain is exactly the other side's loss.

13 A story: the concert ticket

- Payoff = what the option delivers at expiry
- Profit = payoff, less the premium paid
- A ticket that pays $50 for $30 earns $20
- Payoff and profit are different numbers

IN THE LESSON

- You buy a concert ticket for thirty dollars, and a friend offers you fifty for it on the night.
- What did the ticket pay?
- Fifty dollars.
- What did you earn?
- Twenty.
- The difference is what you paid to get it.
- Options work in just the same way.
- The payoff is what the option delivers at expiry.
- The profit is the payoff less what you paid for the option, the premium.
- Payoff tells you what the right is worth on the last day.
- Profit tells you whether the whole trade made money.
- They are different numbers, and they give different pictures.
- Questions often show one and ask about the other.

14 Profit and break-even

Buyer profit = payoff − premium

Call payoff	Call: max(0, S − X)
Premium paid	Paid at the start, always
Profit	Payoff less premium
Break-even	Call: X + prem; put: X − prem

IN THE LESSON

- Here is the relationship.
- For the buyer, profit equals payoff minus the premium.
- The premium is paid at the start, whatever happens, so it is subtracted from every outcome.
- For the writer, who received the premium, profit equals the premium minus what the writer pays out.
- That makes the writer's best case the premium itself.
- Next, break-even, the underlying price at which profit is exactly zero.
- For a call, the payoff has to cover the premium, so break-even is the exercise price plus the premium.
- For a put it is the exercise price minus the premium.
- Remember the direction: a call needs the price to rise, a put needs it to fall.

15 Example 4: a call, payoff against profit

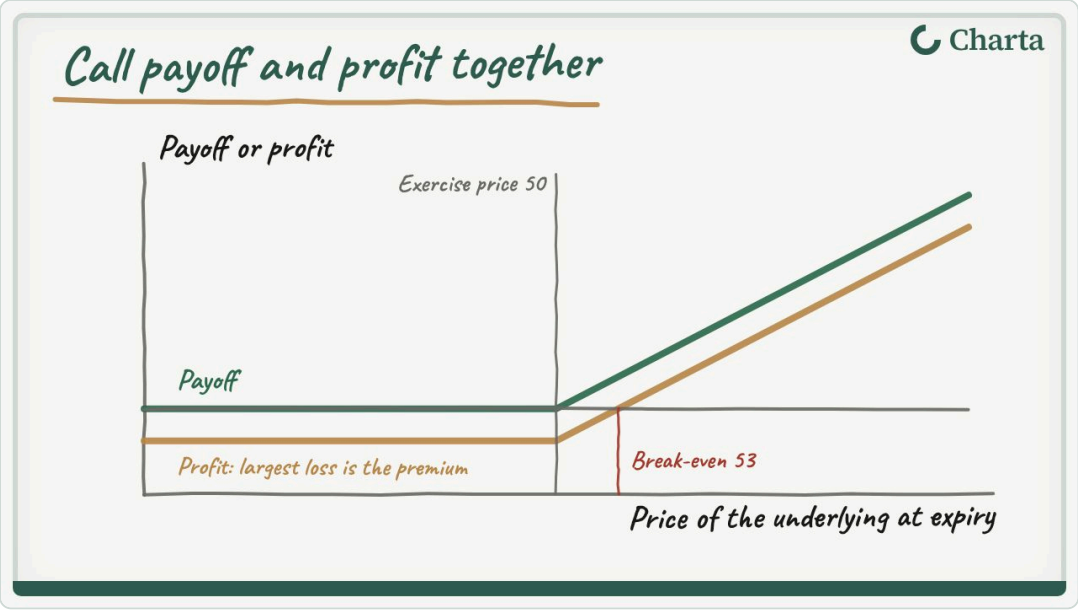
Call, X = $50, premium $3. Payoff then profit

Share at $40	payoff 0, abandoned	**profit −$3**
Share at $52	payoff 2, still a loss	**profit −$1**
Share at $53	payoff 3, break-even	**profit $0**
Share at $58	payoff 8	**profit $5**

IN THE LESSON

- Example four.
- The call on Brightwell, exercise price fifty dollars, now costs a premium of three dollars.
- Take four expiry prices.
- At forty, the call is abandoned.
- Payoff zero.
- Profit is zero minus three, a loss of three, the whole premium.
- At fifty-three the payoff is three, which exactly covers the premium, so profit is zero.
- That is break-even, fifty plus three.
- At fifty-eight, payoff eight, profit five.
- And at fifty-two, payoff two, but profit minus one.
- The call is exercised and the trade still loses money.
- Both things are true, because they describe different lines.
- The most the buyer can lose is the premium, three dollars.

16 Call payoff and profit together



IN THE LESSON

- Now both lines on one picture.
- Across the bottom is the price of the underlying at expiry, up the side the amount, in dollars.
- The grey line is zero.
- The green line is the payoff of the call, flat at zero and then rising from the exercise price of fifty.
- The gold line is the profit, and it is the same shape pushed down by the premium, three dollars.
- Do you see the gap?
- It is the same everywhere.
- That gap is the premium, paid whatever happens.
- Follow the gold line from the left.
- It is flat at minus three, the largest loss.
- It crosses zero at fifty-three, the break-even.
- Between fifty and fifty-three the green line is up while the gold line is still below zero.

17 Example 5: a put, payoff against profit

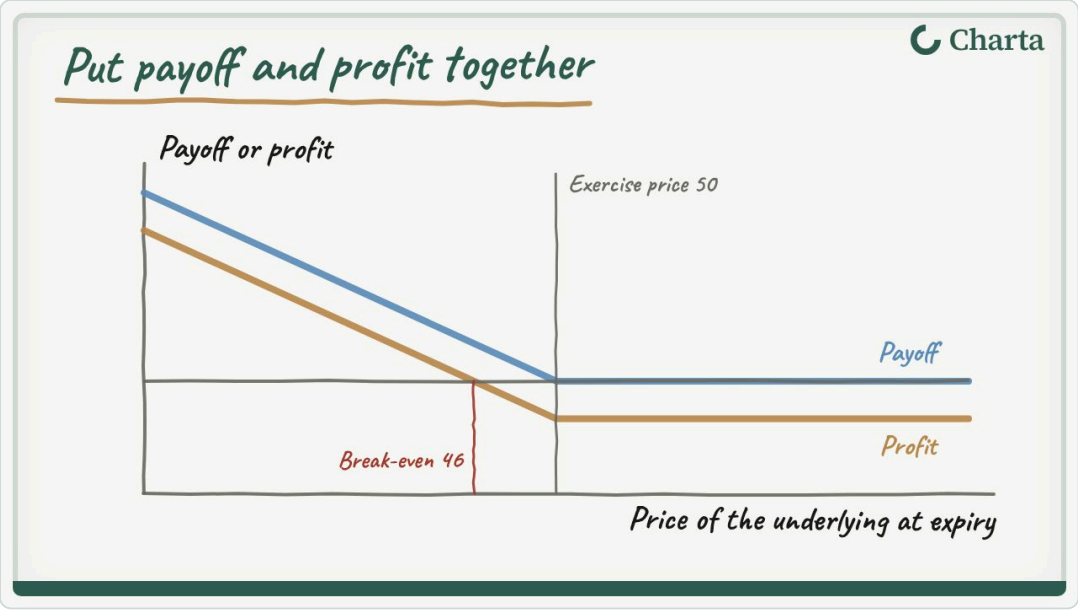
Put, X = $50, premium $4. Buyer's payoff then profit

Share at $38	payoff 12	**profit $8**
Share at $46	payoff 4, break-even	**profit $0**
Share at $55	payoff 0, abandoned	**profit −$4**
Writer, share at $38	4 − 12	**profit −$8**

IN THE LESSON

- Example five, the put.
- A put on Brightwell with exercise price fifty costs a premium of four dollars.
- If the share finishes at thirty-eight, payoff is twelve, profit is twelve minus four, so eight dollars.
- The break-even is fifty minus four, forty-six.
- At forty-six the payoff is four, exactly covering the premium.
- At fifty-five the put is abandoned: payoff zero, and the profit is minus four, the whole premium.
- Now the writer of this put.
- Receiving four dollars, the writer keeps all of it if the put is abandoned.
- At thirty-eight, the writer pays out twelve and so ends up with a loss of eight.
- Same numbers, opposite signs, as always.

18 Put payoff and profit together



IN THE LESSON

- Here is the put in the same style.
- Price of the underlying at expiry along the bottom, dollars up the side.
- The grey line is zero.
- The blue line is the payoff of the put.
- It falls from the top left, as the price rises, to zero at the exercise price of fifty, then runs flat along zero.
- The gold line is the profit, the same shape lowered by the premium of four dollars.
- On the right it is flat at minus four, the buyer's largest loss.
- It crosses zero at forty-six, the break-even, which is below the exercise price.
- Keep that direction in mind.
- For a put, the price has to fall past the strike, and then a little further, before the buyer is ahead.

19 Four mistakes to avoid so far

- 1. Payoff and profit are not the same
- 2. Call: X + premium. Put: X − premium
- 3. Exercised does not mean profitable
- 4. Writer's best case = the premium

IN THE LESSON

- Time to pause on the traps, because they cost marks.
- One.
- Calling the payoff the profit.
- Payoff ignores the premium, profit includes it.
- Two.
- Getting the break-even direction wrong.
- A call breaks even at the exercise price plus the premium.
- A put breaks even at the exercise price minus the premium.
- Three.
- Thinking that an exercised option must have made money.
- An option can pay out and the trade can still lose, between the exercise price and the break-even.
- Four.
- Mixing up the sides.
- A writer's best case is the premium, and a call writer's worst case is unlimited.
- Before any question, ask three things: call or put, buyer or writer, payoff or profit.

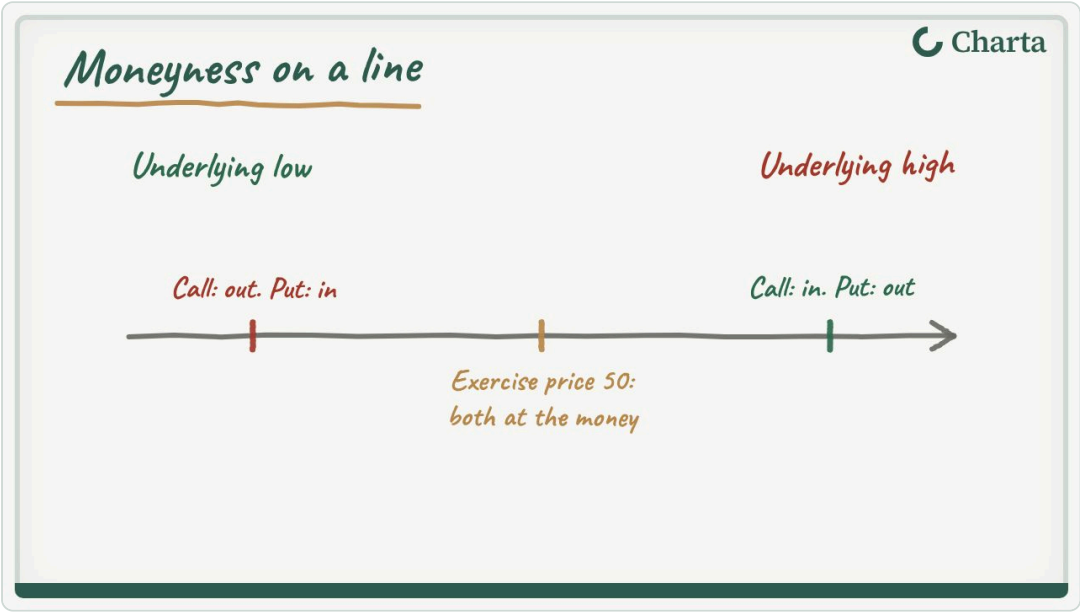
20 A story: is the coupon worth using today?

- Moneyness = underlying today vs exercise price
- In the money: using it now would pay
- At the money: S equals X
- Out of the money: using it now pays nothing

IN THE LESSON

- Picture a coupon that lets you buy a jacket for fifty dollars.
- The shop is selling that jacket today for fifty-two.
- Using the coupon today would save you two dollars.
- So the coupon is valuable right now.
- Another coupon lets you buy for sixty, but the jacket costs fifty-two, so using it today saves nothing.
- Finance has a word for this question, moneyness.
- Moneyness compares the underlying's price today with the exercise price, and asks one thing: if the option could be used right now, would it pay?
- If yes, the option is in the money.
- If the two prices are equal, at the money.
- If it would pay nothing, out of the money.

21 Moneyness on a line



IN THE LESSON

- Here is moneyness on one line, with the underlying's price today rising from left to right, and the exercise price of fifty marked in the middle.
- Start at the exercise price.
- There, a call and a put are both at the money.
- Now move to the right, where the price is above the exercise price.
- A call can buy below market, so it is in the money.
- A put would sell below market, so it is out of the money.
- Move to the left, where the price is below the exercise price, and everything swaps.
- The call is out of the money, and the put is in the money.
- At any price, a call and a put with the same strike are never both in the money.

22 Example 6: Brightwell at $52

Share today: $52. Moneyness by exercise price

Strike 45	**call in by 7, put out**
Strike 50	call in by 2, put out
Strike 52	both at the money
Strike 60	call out, put in by 8

IN THE LESSON

- Example six.
- Brightwell trades at fifty-two dollars today.
- Look at calls and puts with four different exercise prices.
- A call with a strike of forty-five is in the money by seven dollars, because buying at forty-five something worth fifty-two gains seven.
- A call at fifty is in the money by two.
- A call at fifty-two is at the money.
- A call at sixty is out of the money.
- Now the puts.
- A put at sixty is in the money by eight, because selling at sixty something worth fifty-two gains eight.
- Puts at forty-five, fifty and fifty-two have nothing to gain.
- Notice the direction reverses between the two types.

23 Intrinsic value and time value

Brightwell at $52, three months left (illustrative quotes)

Call X=45: intrinsic value	max(0, 52 − 45)	**$7.00**
Call X=45: time value	8.10 − 7.00	**$1.10**
Call X=60: intrinsic value	max(0, 52 − 60)	**$0**
Call X=60: all time value	price 1.20 − 0	**$1.20**

IN THE LESSON

- One more point, and it fixes a very common muddle.
- Moneyness tells you about intrinsic value, what the option would pay if used right now.
- It does not tell you the option's price.
- Look at these made-up quotes with Brightwell at fifty-two and three months to go.
- The call struck at forty-five costs eight dollars ten.
- Seven of that is intrinsic value.
- The remaining one dollar ten is time value, a payment for the chance of further movement.
- The call struck at sixty is out of the money.
- Its intrinsic value is zero, yet it costs one dollar twenty, all time value.
- So out of the money does not mean worthless.
- It means worthless if today were the last day.

24 A story: the shareholder's two choices

- Own the share, then add one option
- Protective put: long share + long put
- Covered call: long share + short call
- Neither is free: each trades one thing for another

IN THE LESSON

- Suppose you own a thousand Brightwell shares, bought at fifty dollars.
- Two worries keep you awake.
- One: the price might crash.
- Two: the price might simply go nowhere, and your money earns nothing.
- There is an option answer to each.
- For the first, you buy insurance, a put.
- That is a protective put.
- You own the share and a put on it.
- For the second, you sell someone else a right to buy your shares at a higher price, and you keep the fee.
- That is a covered call.
- It is covered because you own the shares you might have to deliver.
- Neither is free.
- One costs a premium, the other gives away upside.

25 Protective put: the pay-off arithmetic

Profit = S + max(0, X − S) − S0 − put premium

Price at expiry, S	Price of the share at expiry
Exercise price, X	Floor: value never below X
Price paid for the share, S0	What you paid for the share
Premium paid	Cost of the insurance

IN THE LESSON

- Start with the protective put.
- The position is the share plus a put on it.
- At expiry its value is the share price S plus the put payoff, the larger of zero and X minus S.
- If the share finishes above X, the put is abandoned and you simply hold the share.
- If it finishes below X, the put pays the gap, so the position is worth X no matter how far the share has dropped.
- That is the floor.
- The profit is the value, less what you paid for the share, less the premium.
- So the worst case is the share price paid, minus X, plus the premium.
- The best case is unlimited, reduced by the premium.

26 Example 7: the protective put

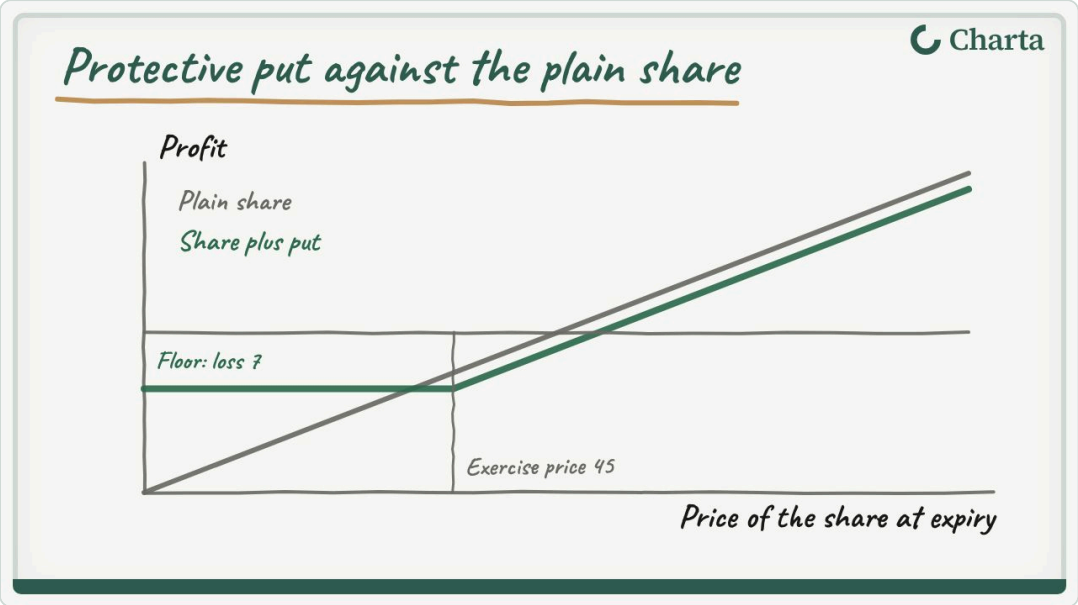
Buy share at $50 + put X = $45 for $2. Profit per share

Share falls to $35	−15 + 10 − 2	**−$7**
Share stays at $50	0 + 0 − 2	**−$2**
Share rises to $65	+15 + 0 − 2	**+$13**
Worst case, any price ≤ $45	50 − 45 + 2	**−$7**

IN THE LESSON

- Example seven.
- You buy a Brightwell share at fifty dollars and a put with an exercise price of forty-five, for a premium of two dollars.
- If the share falls to thirty-five, the put pays ten.
- The share has lost fifteen, so shares plus put is minus five, and after the premium, minus seven.
- If the share stays at fifty, the put is abandoned, and you are down the premium, minus two.
- If it rises to sixty-five, you gain fifteen on the share, less two, thirteen dollars.
- The worst case is the same whether the share falls to thirty-five or to zero.
- It is the fifty paid minus the floor of forty-five, which is five, plus the premium of two.
- Seven dollars.
- Break-even is fifty-two.

27 Protective put against the plain share



IN THE LESSON

- Here is the picture.
- Price of the share at expiry runs along the bottom, and profit up the side.
- The grey line is zero.
- The thin grey line is the plain share bought at fifty.
- It rises and falls one for one.
- Now the green line, the protective put.
- Look at the left.
- Below the exercise price of forty-five the green line goes flat at minus seven.
- That is the floor.
- The loss stops there.
- Look at the right.
- The green line runs parallel to the share, but a little lower, by the premium of two dollars.
- That gap is what the insurance costs, and it is paid in every outcome, including the ones in which you never needed it.

28 Covered call: the pay-off arithmetic

Profit = S − max(0, S − X) − S0 + call premium

Price at expiry, S	Price of the share at expiry
Exercise price, X	Cap: value never above X
Price paid for the share, S0	What you paid for the share
Premium paid	Fee you receive for the call

IN THE LESSON

- Now the covered call.
- The position is the share plus a call you have written on it.
- At expiry, its value is the share price S, minus what you owe on the call, the larger of zero and S minus X.
- If the share finishes below X, the call is abandoned and you hold the share.
- If it finishes above X, the call is exercised and you hand the share over at X, so the position is worth X.
- That is the cap.
- The profit is that value, less the price you paid for the share, plus the premium you received for the call.
- So the best case is X minus what you paid, plus the premium, and no more.

29 Example 8: the covered call

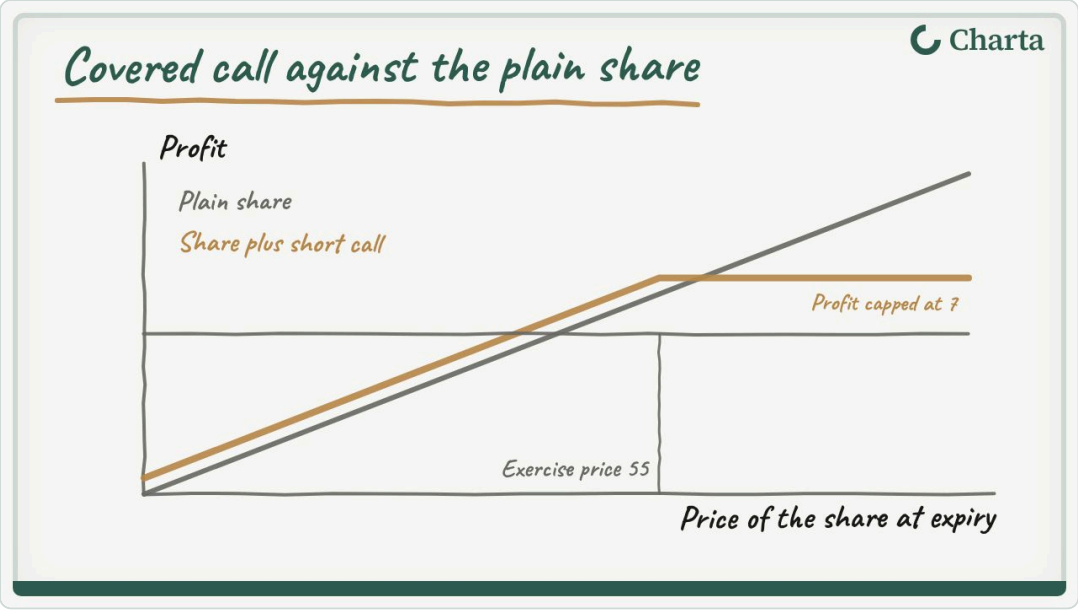
Buy share at $50 + write call X = $55 for $2. Profit per share

Share falls to $35	−15 + 2	**−$13**
Share stays at $50	0 + 2	**+$2**
Share rises to $65	55 − 50 + 2	**+$7**
Best case, any price ≥ $55	55 − 50 + 2	**+$7**

IN THE LESSON

- Example eight.
- Same share, bought at fifty dollars.
- This time you write a call with an exercise price of fifty-five and collect a premium of two.
- If the share falls to thirty-five, you lose fifteen, but you keep the two, minus thirteen.
- If it stays at fifty, the call is abandoned and you keep the premium, plus two.
- If it rises to sixty-five, the call is exercised.
- You hand over at fifty-five, so the gain is five, plus the two, seven dollars.
- And seven is also the most you can ever make, whether the share goes to sixty-five or to one hundred.
- Break-even is the price paid less the premium, forty-eight.

30 Covered call against the plain share



IN THE LESSON

- Here is the covered call on the same axes.
- Price of the share at expiry along the bottom, profit up the side.
- The thin grey line is the plain share again, rising one for one.
- The gold line is the covered call.
- On the left it runs parallel to the share, but higher, by the two dollar premium.
- That extra is the reward.
- That is why a covered call helps when the market is flat or slightly down.
- Then look at the right.
- At the exercise price of fifty-five the gold line bends and goes flat at plus seven.
- That is the cap.
- The shares would have earned more, but the call writer gave the gain away.
- Notice also that the loss on the left is still large.
- The premium only cushions a fall by two dollars.

31 Example 9: three outcomes side by side

Profit per share, bought at $50

Share at expiry	$35 | $50 | $65
Plain share	−15 | 0 | +15
Protective put	−7 | −2 | +13
Covered call	−13 | +2 | +7

IN THE LESSON

- Finally put all three together, still on a share bought at fifty dollars, with the put at forty-five costing two and the call at fifty-five bringing in two.
- If the share falls to thirty-five, the plain share loses fifteen, the protective put loses only seven and the covered call loses thirteen.
- If the share stays at fifty, the plain share earns nothing, the protective put loses its premium, and the covered call earns two.
- If the share rises to sixty-five, the plain share gains fifteen, the protective put gains thirteen, and the covered call gains only seven.
- Each strategy wins in one column and loses in another.
- There is no column where either strategy is free.

32 Four mistakes with the two strategies

- 1. Protective put costs the premium, always
- 2. Covered call gives up gains above X
- 3. Covered call does not remove the downside
- 4. Put: S0 + premium. Call: S0 − premium

IN THE LESSON

- Some more traps.
- One.
- Treating the protective put as free.
- Its cost is the premium, which lowers your result everywhere.
- Two.
- Forgetting that the covered call forgoes the upside.
- Above the exercise price you earn the same whatever the share does.
- Three.
- Quoting the covered call as risk free.
- The premium only cushions a fall by a small amount, so the downside is almost the full share.
- Four.
- Mixing up break-even.
- For the protective put it is the price paid plus the premium.
- For the covered call it is the price paid minus the premium.
- A good check: a put is bought, so it costs you, and a call is sold, so it pays you.

33 Recap: payoffs, profit and the two strategies

Call: max(0, S − X) Put: max(0, X − S) Profit = payoff − premium

Call payoff	Call pays when S is above X
Put payoff	Put pays when S is below X
Break-even	Call: X + prem. Put: X − prem
Floor	Protective put: loss stops
Cap	Covered call: gain stops

IN THE LESSON

- Let us recap.
- A call pays the larger of zero and S minus X.
- A put pays the larger of zero and X minus S.
- Buyers never have a negative payoff, writers never have a positive one, and the two sides sum to zero.
- Profit is the payoff less the premium for the buyer, and the premium less the payoff for the writer.
- The call breaks even at X plus the premium, the put at X minus the premium.
- Moneyness asks whether using the option now would pay.
- A protective put puts a floor under the share and costs the premium.
- A covered call puts a cap on the share and pays the premium.
- Neither is free.

34 Try three quick questions

1. Call X = 40, premium 4, share ends at 55. Payoff and profit?
   Answer: Payoff 15; profit 15 − 4 = 11.
2. Share at 52. A put has X = 60. Moneyness?
   Answer: In the money, by 8.
3. Buy share at 50, buy put X = 45 for 2. Worst loss?
   Answer: 50 − 45 + 2 = 7 per share.

IN THE LESSON

- Now try three quick questions.
- Pause after each.
- Question one.
- A call has an exercise price of forty dollars and a premium of four.
- At expiry the share is at fifty-five.
- What are the payoff and the profit?
- The payoff is fifteen dollars, and the profit is eleven dollars.
- Question two.
- A share trades at fifty-two.
- A put has an exercise price of sixty.
- Is it in, at or out of the money, and by how much?
- In the money, by eight dollars.
- Question three.
- You buy a share at fifty, and a put at forty-five for two dollars.
- What is the most you can lose per share?
- Seven dollars: five of price fall plus the two premium.
- Well done.