

Risk Management and Derivatives | Lecture 11

Trading Strategies: Covered Calls, Protective Puts, Spreads, Collars

Group activity solutions

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Phase 1: Concept checks

- **CT1: (b).** With the shares alone you would have £62. With the covered call you receive £55 (called away) plus the £2 premium = £57. You are £5 worse off than holding. The premium is real income, but it is the price of giving up everything above £55. A covered call is a view that the stock will not rise much, not free money.
- **CT2: (c).** A protective put is insurance. In a calm or rising market you do not collect on it, but you still paid the £1.50 premium up front, so your return is £1.50 lower than holding the share. The protection is valuable when the stock falls hard, but it is never free.
- **CT3: (c).** A straddle profits from a big move in either direction and loses when the stock sits still. At £50.20 the call is worth about £0.20 and the put about £0, so the position is worth roughly £0.20 against a £5.50 cost, a loss of about £5.30. A straddle is a bet on volatility (the size of the move), not on direction.

Phase 2: Desk problem, fully worked

(a) Covered call

Intuition. You own the share and sell a call above the current price. The premium is income you keep, but in exchange you have promised to hand the share over at the strike. So your upside stops at the strike, and the premium is the price of that promise.

Calculation. The completed table:

S_T	stock P/L	short call P/L	total
40	-10	+2	-8
48	-2	+2	0
50	0	+2	+2
55	+5	+2	+7
62	+12	$+2 - (62 - 55) = -5$	+7

- Maximum profit = $(55 - 50) + 2 = \text{£}7$, reached at any $S_T \geq \text{£}55$.
- Breakeven = $50 - 2 = \text{£}48$.
- Capped upside: above £55 your total profit stays at £7 no matter how high the stock goes. At £62 you make £7, not £12, so you gave away £5. This is the cost of the premium income, and it is exactly ConcepTest 1.

(b) Protective put

Intuition. You own the share and buy a put below the current price. The put is insurance: it cannot pay until the stock falls below its strike, and you pay a premium for it whether or not you use it. So the put sets a floor under your losses, but it drags your return in a calm market.

Calculation. The completed table:

S_T	stock P/L	long put P/L	total
40	-10	+6.50	-3.50
46	-4	+0.50	-3.50
48	-2	-1.50	-3.50
50	0	-1.50	-1.50
55	+5	-1.50	+3.50

- Floor (worst case): for any $S_T \leq £48$ the put pays $(48 - S_T)$, so the position is worth £48; net of the £1.50 premium the worst loss is $48 - 50 - 1.50 = -£3.50$.
- Cost: the £1.50 premium, paid whether or not the put is used.
- Breakeven = $50 + 1.50 = £51.50$.

The put caps your loss at £3.50, but it shifts your breakeven up by £1.50 versus holding the share. In a calm market the put is a drag, exactly ConcepTest 2.

(c) Bull call spread

Intuition. You buy a call to get the upside, then sell a higher-strike call to get some cash back. Selling that higher call makes the trade cheaper, but it also caps your gain, because above the higher strike the call you sold cancels your further upside.

Calculation.

- Net cost = $4.00 - 2.00 = £2.00$.
- Max loss = £2.00 (at $S_T \leq £50$).
- Max profit = $(55 - 50) - 2.00 = £3.00$ (at $S_T \geq £55$).
- Breakeven = $50 + 2.00 = £52.00$.

Selling the £55 call cut your cost from £4.00 to £2.00, but it also capped your gain at £3.00. You traded away the far upside to make the trade cheaper, the same trade-off idea as the covered call.

(d) Long straddle

Intuition. You buy a call and a put at the same strike. You are not betting on the direction; you are betting on the size of the move. You profit only if the stock moves far enough, either way, to cover the two premiums. If the stock sits still you lose the lot.

Calculation.

- Total premium = $3.00 + 2.50 = £5.50$.
- Upper breakeven = $50 + 5.50 = £55.50$.
- Lower breakeven = $50 - 5.50 = £44.50$.
- Move needed to profit: more than £5.50 away from £50 in either direction, i.e. above £55.50 or below £44.50. That is an **11%** move ($5.50/50 = 0.11$) before you make a penny.

Between £44.50 and £55.50 you lose money; the worst case is the stock pinned at £50, where you lose the full £5.50. The straddle is long volatility: it needs a big move, not a particular direction.

(e) Zero-cost collar

Intuition. You own the share, buy a put below to set a floor, and sell a call above to pay for that floor. If the put and the call cost the same, the collar costs no cash up front. But it is not free: the true price is the upside you sold above the cap.

Calculation.

- Net premium = 1.20 (paid for the put) – 1.20 (received for the call) = £0.00. The collar is zero-cost.
- Floor = £46 (the put strike): below £46 the put protects you, so the position cannot be worth less than £46.
- Cap = £56 (the call strike): above £56 the share is called away at £56, so your upside is capped at £56.
- Between £46 and £56 you simply hold the share and ride the price (net premium is zero).

A zero-cost collar buys you a floor for “free” in cash terms, but the true price is the upside you sold above £56. Nothing is actually free: compare with the protective put in (b), where you paid cash instead of giving up upside.

Extension

(E1) Butterfly spread. Using the wider quotes (£50 call £6.00, £55 call £3.00, £60 call £1.20): buy the £50 call, sell two £55 calls, buy the £60 call.

- Net cost = $6.00 - 2(3.00) + 1.20 = 6.00 - 6.00 + 1.20 = £1.20$.
- Max profit occurs at $S_T = £55$ (the middle strike): there the long £50 call is worth $(55 - 50) = £5$, while the short £55 calls and the long £60 call expire worthless, so gross £5.00, minus the £1.20 net cost = £3.80.
- Outside £50 to £60 the butterfly loses only its £1.20 cost. It is a cheap bet that the stock lands near £55, the opposite view to the straddle.

(E2) Put-call parity. With $c + Ke^{-rT} = p + S_0$ and $r \approx 0$ so $Ke^{-rT} \approx K$, the parity relation becomes $S_0 + p = c + K$. The left side is the protective put from part (b): hold the share and a put. The right side is a fiduciary call: hold a call and cash K in the bank. They have the same payoff at expiry. So buying the stock and a put is equivalent to buying a call and putting K in the bank. This is the Lecture 10 result in action: there is more than one way to build the same insured payoff.

The one idea behind every part: every option strategy is a trade-off you choose on purpose. Income costs you upside; protection costs you a premium; a cheap floor costs you surrendered gains. Payoffs add and premiums add, leg by leg.

Phase 3: Case, what happened

You were stopped on Friday 16 October 1987, with the portfolio-insurance models about to sell into a falling market. Here is what happened next.

Monday 19 October 1987, “Black Monday”. The Dow Jones Industrial Average opened at 2,246.74 and closed at 1,738.74. It fell 508 points, or **22.6%**, in a single day, still the largest one-day percentage fall in the history of the index. The S&P 500 fell about 20%. It was global: 23 major markets dropped, and Hong Kong fell about 45.8%.

What happened to portfolio insurance? Exactly what your Q2 and Q3 answers predicted. As prices fell, every portfolio-insurance program got the same instruction at the same time: sell futures. The **Brady Commission**, the official 1988 inquiry chaired by Nicholas Brady, found that this mechanical, one-directional selling poured several billion dollars of sell orders into an already-falling market and amplified the decline.

Worse, the synthetic put **failed precisely when it was needed**. Prices gapped down so fast that the dynamic hedge could not be executed at the assumed prices; the futures market itself seized up, with futures trading at a steep discount to the underlying stocks. The funds could not sell fast enough or near the prices the model relied on, so the promised “floor” was not delivered.

The strategy designed to protect investors helped sink the market and then did not protect them.

One honest nuance. Economists have argued for years about how big the portfolio-insurance effect really was. Markets with no portfolio insurance crashed just as hard that day, so it is fairest to call portfolio insurance an *amplifier* of the fall rather than its sole cause. But the lesson for us is exact.

The lesson, stated plainly. A bought put (part (b)) has a fixed cost and always pays at expiry: its payoff is contractual. Portfolio insurance is the put you try to *manufacture* by trading, and that depends on being able to trade. When markets gap and liquidity vanishes, the contract still pays but the manufacture does not. This is why the next thing we study is dynamic hedging and the Greeks: the question “why did the synthetic put fail?” is answered there.

A bought option is a contract; it pays whatever the market does. A synthetic option is a trading plan; it only works if you can still trade. A steady-looking payoff can hide a rare but very large loss.

End of solutions.