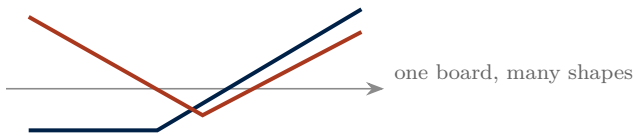
Trading Strategies Involving Options

Lecture 11

https://fatih.ai/sjtu/derivatives/



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Outline

One option and the underlying: the decision

The decision on the desk

Three lectures of preparation meet one order ticket:

- Topic 9 **priced** the floor — 1,500 June 3.8 puts, ¥405,000, 0.675% of the book.
- Topic 10 **certified** the board lawful, and produced a twin: bills plus calls, the same payoff by law.
- Lecture 3's futures hedge still stands: free, and symmetric.

Tonight we choose among them, then build everything else the board makes possible. The method is fixed: **construction** (which contracts), **payoff** (the assembled diagram), **cost** (premium, cap, breakeven).

The one rule

- Structures are **sums of legs**: payoffs add, premiums add. Nothing tonight is new — only assembled.
- We draw **profit at expiry** (payoff net of premiums; interest on premiums is third-decimal noise at two months).
- All legs share the June expiry unless stated; one exception in Block B carries two maturities.
- The exchange recognises paired legs: a recognised spread posts **reduced margin** (combination-strategy margin — verify current parameters before trading).

Main point: every strategy tonight is a sum of legs, so its diagram is the sum of the kinks and its cost is the sum of the premiums — read the legs and the whole follows.

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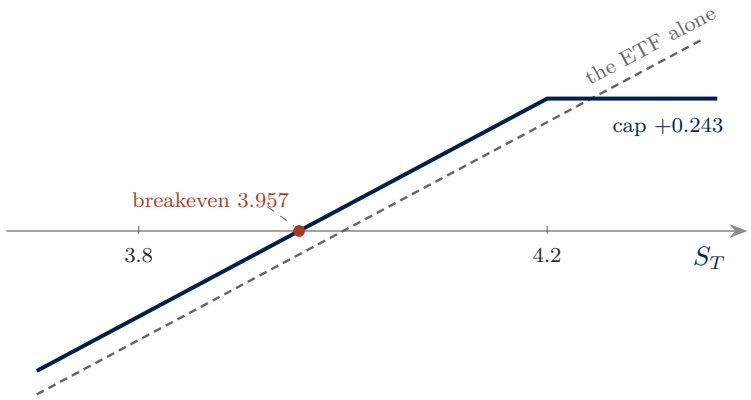
breakeven shifts down to	3.957
cash margin	none — the units are the cover

Topic 9's mechanics, assembled: tier-one permission, in-kind cover, premium in the bank. The *strategy* question is what was sold to earn the income — and the diagram answers it.

Covered call: the diagram



Below 4.2 you beat the bare ETF by 0.043; above, the lines separate forever. The "income" is rent on the right tail — collected knowingly, or not at all.

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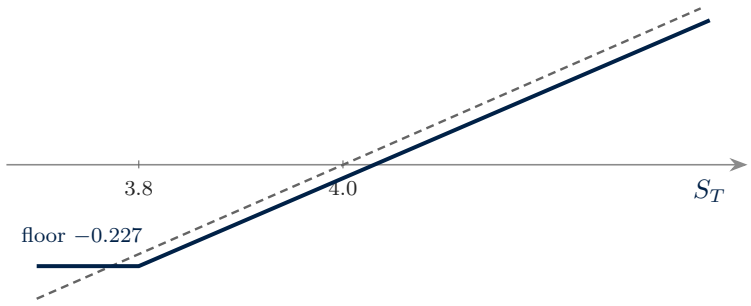
upside	untouched, minus the 0.027 drag

The mirror of the covered call: there a tail was sold for income; here a tail is *bought out* for a premium. Insurance, with the policy terms chosen off the board.

Choosing the strike is choosing the deductible



strike	premium	% of book	deductible
3.8	0.027	0.68%	5.0%
3.9	0.062	1.55%	2.5%
4.0	0.106	2.65%	0%

The decision

Three lawful structures, one mandate: *protect the ¥60M book without selling its upside.*

	cost today	downside	upside

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The futures hedge contradicts the mandate; the twin requires selling the whole book to buy bills (turnover, impact, re-entry). **Decision: buy the floor — 1,500 June 3.8 puts, ¥405,000.** *Main point: a structure has no virtue in the abstract — the right one is the one that fits the mandate; change the mandate and a different structure wins.*

The twin, audited once more

Topic 10's law said the two floors are one object:

$$\underbrace{4.000 + 0.027}_{\text{ETF+put} = 4.027} \qquad \text{vs} \qquad \underbrace{3.7874 + 0.240}_{\text{bills+call} = 4.0274}$$

- Same payoff in every state; prices match to the board's familiar 0.0003.
- The choice between twins is pure **implementation**: keeping a ¥60M book versus rebuilding one — turnover, impact, tracking, permissions.

Main point: parity lets the payoff question and the implementation question separate cleanly — the law settles what, the desk settles how.

Principal protection, decomposed

"Your deposit back, guaranteed — plus the market's upside." The X-ray, on a three-year note at $r = 2\%$:

zero-coupon bond maturing at 100	costs 94.18

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A bond plus a kink — nothing else. The local structured-deposit shelf (which peaked above **¥12 trillion** in 2020, before a regulatory clampdown) is largely this skeleton in retail clothing. The trained question: what bond, what option, what fees?

The same X-ray, on last week's case

Recall the snowballs (Topic 9): handsome "coupons," until the knock-in.

- Strategy literacy decodes them in one line: the coupon was **premium income from sold puts** — the buyer was the insurance *writer*, and rarely knew it.
- A principal-protected note *buys* the kink; a snowball *sells* it. Same shelf, opposite tails.

One diagram-reading habit separates the two products — and the two outcomes.

The view-to-structure table, begun

view-to-structure	
protect a holding	protective put · principal-protected note
income on a holding	covered call
cheap conviction on direction	Block B
a view on *calm*	Block B
no directional view at all	Block B
distance, not direction	Block C

Block B: spreads — why pay for payoff territory your view never claimed?

Spreads

Conviction has a pricing problem

Your view is "up to about 4.1, probably." The 3.9 call costs 0.175 — but it pays on *everything* above 3.9, without limit. You are buying territory your view never claimed. The answer: **sell the territory back**. Keep the payoff where the view lives; let someone else pay you for the rest. *Main point: a spread is a view trimmed to fit — you fund the payoff you want by selling the payoff you do not need.*

Bull call spread: construction and cost

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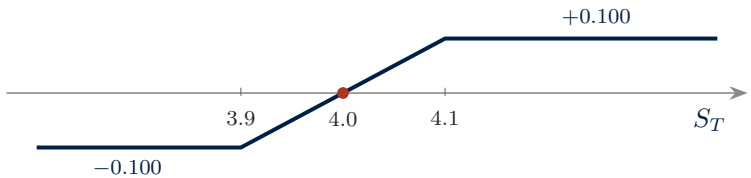
breakeven	4.000 — today's spot

A centred spread costs **half its width**: the market judges up and down about even around the forward, and prices the coin flip fairly.

Bull spread: the diagram



Bounded loss, bounded gain, breakeven at the centre. Read it as two transfers: below 3.9 you lose what a bare 3.9 call would lose, *minus* the 0.075 rent collected; above 4.1 the sold call hands your surplus to its buyer.

The same position, by the other wing

Build the *same* bull view from puts: sell the 4.1 put (0.161), buy the 3.9 put (0.062).

- Net **credit** 0.099 today; worst case -0.101 below 3.9; best case keep the 0.099 above 4.1.
- The same staircase as the call version, to within **0.001** — the board's parity gap, appearing now at the level of a strategy.

Main point: debit by calls or credit by puts is cosmetics — the position is the position, and parity guarantees the routes cannot differ by more than frictions.

Bear spreads: the mirror

Reverse the view, swap the roles:

- **With puts**: buy the 4.1 put (0.161), sell the 3.9 put (0.062): debit 0.099; pays +0.101 below 3.9, loses the debit above 4.1.
- **With calls**: sell 3.9, buy 4.1: credit 0.100, the same mirror staircase.

One shape, four constructions, two directions: views are the input; the board supplies whichever wing is cheapest to route through.

The box: four options, one bond

Buy the bull call spread (0.100) *and* the bear put spread (0.099), same strikes 3.9/4.1. Total 0.199. At expiry:

at expiry	$S_T < 3.9$	3.9–4.1	$S_T > 4.1$

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together	**0.2**	**0.2**	**0.2**

Main point: pay 0.199, collect 0.200 in two months with certainty — four options have manufactured Lecture 4's bond, and the board's price implies a rate (3.0% vs 2% money; 0.0003 in price: lawful).

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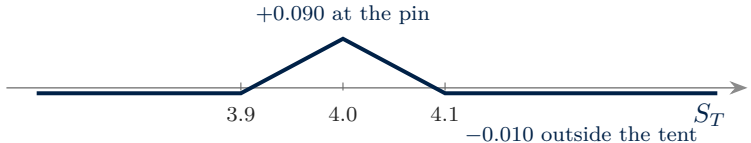
Nine-to-one on *stillness*. The market sells the pin for a fen because pins are needles: the payoff needs the ETF to finish almost exactly where it stands.

Butterfly: the diagram



The tent: two bought wings, two sold poles — paying for the centre by renting out both sides. The first structure tonight whose enemy is *movement itself*.

The board's third law: convexity in the strike

A butterfly's cost can never be negative — a tent that *paid* you to own only non-negative payoffs would be free money. So the law: **call prices are convex in the strike**. The board, on trial again:

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the three butterfly costs	$+0.010,\ +0.010,\ +0.013$

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Main point: drops shrinking and tents all positive means call prices are convex — and a butterfly's price is a probability the market assigns to the pin, so convexity is exactly the statement that those probabilities are non-negative.

Two clocks: the calendar spread

Sell the June 4.0 call (0.120); buy the *September* 4.0 call (≈ 0.19, roughly $0.120 \times \sqrt{5/2}$ — a scaling Topic 13 will earn honestly).

- Net debit ≈ 0.07. The position profits if June expires near 4.0: the near option dies worthless while the far one still holds months of time value.
- The first strategy whose engine is **time itself**: near options shed time value faster than far ones — a decay with a Greek name that Topic 14 owns.

Its exact profit curve needs the value of a *living* option — tonight's expiry diagrams cannot draw it. Hold that thought for frame 34.

The view-to-structure table, continued

view-to-structure	
protect a holding	protective put · PPN
income on a holding	covered call
cheap conviction on direction	bull / bear spreads
a view on calm	butterfly · calendar
no directional view at all	the box — a bond in options
distance, not direction	Block C, now

Block C: one family of views remains — *something large is coming*, direction unknown.

Combinations, the collar, and the close

Views about distance

Some weeks the question is not *which way* — a policy meeting, an earnings night, a pending headline. The honest view is **"far from here, direction unknown."** Directional structures waste that view: half their territory bets on the wrong sign.

What is needed is a structure that pays on *distance* — and the board sells one off the shelf.

Straddle: construction and cost

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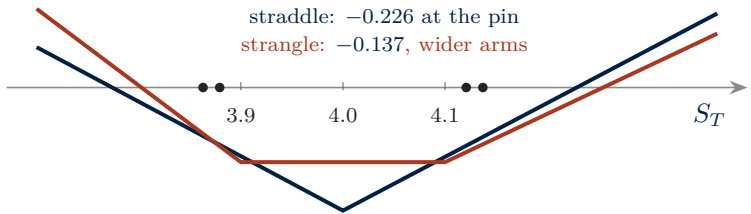
premium, both wings	0.226
breakevens	3.774 and 4.226
the view, in one number	$\lvert\text{move}\rvert > 5.7\%$ in 2 mo

Main point: a straddle stops trading direction and starts trading distance — the 0.226 is the market's price of movement, so buying it is buying volatility, the one dial nobody can observe.

Straddle and strangle: the diagrams



The V and the flat-bottomed V. The strangle is a cheaper ticket (0.137) with a longer runway (breakevens 3.763 / 4.237): pay less, need more — the board never gives both.

The seller's side

Every bought straddle has a seller, collecting 0.226 against unbounded tails. Sometimes wise — calm markets pay rent — but read the lineage:

- the **192× day** (Topic 9) was a sold wing's loss: a fortnight of collected fen, gone in an afternoon;
- the **snowballs** were short-volatility cousins in retail wrapping;
- which is why sellers of tails face the margin machine *daily*, by design.

Selling distance is a professional's trade: mandated, margined, sized. The board lets anyone hold the pen; the clearing machine decides who may keep writing.

Tilted distance: strips and straps

Convinced it moves, but *leaning* on direction?

- **Strip**: one call + *two* puts (0.332) — distance, weighted to the downside.
- **Strap**: two calls + one put (0.346) — distance, weighted to the upside.

Nothing new — only the leg counts changed. By now you can invent these yourself; the names matter less than the habit of building from legs.

Sliding the spread: conviction, priced continuously

The same bull spread, walked along the board:

strikes	debit	max profit	breakeven

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3.9 / 4.1	0.100	0.100	4.000
4.0 / 4.2	0.077	0.123	4.077

Sliding the spread: conviction, priced continuously

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3.8 / 4.0	0.120	0.080	3.920
3.9 / 4.1	0.100	0.100	4.000
4.0 / 4.2	0.077	0.123	4.077

Slide the strikes outward and the odds lengthen as the ticket cheapens: **the board prices conviction continuously**. Choosing strikes is stating your forecast's centre and confidence.

The collar: a floor that pays for itself

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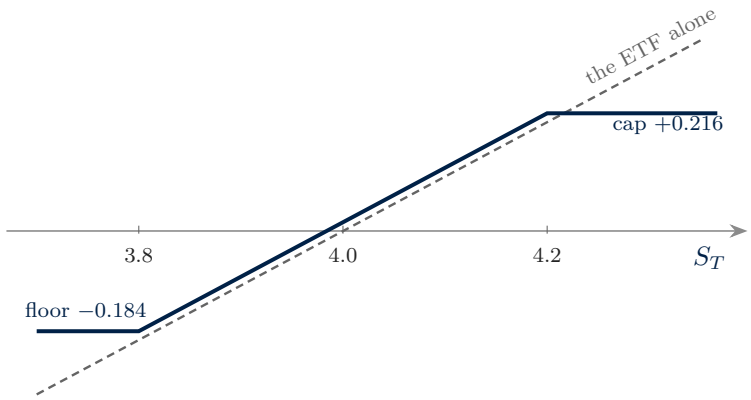
The covered call funds the protective put, with change. Insurance, free at the till — but paid for at the cap. Which re-opens frame 8's decision…

The collar: the diagram



A corridor: the book now lives between -4.6% and $+5.4\%$, whatever the world does. Floor bought, ceiling sold, a sliver of credit left over.

Case: the collar that owned the airline

Week three told the story; tonight you can read the blueprint. In 2008, major carriers here hedged fuel with collar structures — long caps on crude, financed by **sold floors**, often *ratioed*: more floor sold than cap bought, for a fatter credit.

- Crude fell from near $147 to under $40. The bought caps died quietly; the sold floors — in excess size — came due. Fair-value losses ran to **billions of yuan per carrier** (China Eastern, roughly $906m), and the airlines later disputed the contracts.
- The structure was not the error; the *reading* was: a credit collar is insurance paid for with a tail.

Main point: the leg that pays your premium owns your tail — a credit is never free, it is a tail sold, and the ratio is how "capped upside" becomes "open downside".

The decision, re-opened and reaffirmed

Should frame 8's ¥405,000 have been a free collar?

- The collar's credit is the price of the cap. Equity's long-run return arrives in **bursts**; cap the right tail and you may cap the very rallies the book exists to catch.
- The mandate said *keep the upside*. The collar sells its far end; the put does not.

Reaffirmed: the put stands — recorded with reasons, and with the collar filed for the day the premium budget tightens. A decision is an argument, not a reflex.

The view-to-structure table, complete

view-to-structure — complete

protect a holding	protective put · PPN · collar (paid with the cap)
income on a holding	covered call
cheap conviction on direction	bull / bear spreads, slid to taste
a view on calm	butterfly · calendar · short strangle (margined)
distance, not direction	straddle · strangle · strips and straps
no directional view at all	the box — a bond in options

Main point: the table is closed under parity — every cell is reachable by calls, puts, or mixtures, so the catalogue is a finite grammar producing endless sentences, and the routes differ only in frictions.

What tonight's diagrams hide

Every picture tonight was drawn **at expiry**. While alive, positions behave differently:

- the butterfly's tent is a smooth hill that only sharpens into a peak at expiry;
- the calendar spread *exists* entirely in that difference — expiry analysis cannot draw it at all;
- managing any structure mid-life — adjusting, exiting, rolling — needs the value of a *living* option.

Main point: tonight you can build; to steer, you need a model of movement and the sensitivities it implies — which is the rest of Part II.

Summary: the ledger of tails

- Lectures 1–8 priced and repackaged risk by no-arbitrage; Lectures 9–10 introduced and bounded the option; tonight assembled them into strategies.
- Lecture 11: **every tail you keep is paid for; every tail you sell pays you.**

Covered calls rent out the right tail; protective puts buy out the left; spreads sell unclaimed territory; straddles buy both ends; collars trade tail for tail. One ledger runs the whole table — so choose your tails on purpose.

A desk note

the floor	**executed**: 1,500 June 3.8 puts, ¥405k; collar considered and declined — the mandate keeps the right tail; refile if the premium budget tightens
tail policy	no tail sold without a written mandate naming it — covered calls, short straddles, and ratio legs all included; the 2008 collars are the standing exhibit
the table	view first, structure second, never reversed; strikes chosen as forecasts, not habits
the audits	parity, convexity, and box-rate checks run weekly; a third-of-a-fen gap is a spread, not a strategy
mid-life	all P&L tonight is expiry P&L; no structure adjusted mid-life until the desk holds the Greeks

In-class problems

A. Build the bear spread *with calls* on 3.9/4.1: cost it (net premium, max profit, max loss, breakeven) and state which tail you sold.

B. A client profits if the ETF ends inside [3.9, 4.1]. Design two structures from the board — one collecting premium, one paying it — and compare their worst cases and margin treatment.

C. The narrow box (3.9/4.1) implied 3.0%; price the wide box (3.8/4.2) and reconcile both with the 2% money market in *price* terms.

What carries into the rest of Part II

- butterflies price the **pin** — Topic 12's trees turn that into risk-neutral probability, literally;
- the calendar's $\sqrt{\text{time}}$ premium scaling $\rightarrow$ earned by the formula (Topic 13), when the IV column lights up;
- every structure's **mid-life** behaviour $\rightarrow$ the Greeks (Topic 14): theta for the calendar, gamma for the pin, vega for the straddle;
- the audits (parity, convexity, box) $\rightarrow$ the desk's permanent morning checklist.

A structure for every view, a cost for every structure, an audit for every cost.

But every diagram tonight was drawn at expiry.
Next: how an option lives — a model of movement, one step at a time.

Topic 12: binomial trees — pricing the interior of the corridor,
and the American put the dealer would not price for us.