STIR Options

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STIR Options

Options on **short-term interest rate futures**

Call Options

Buy the underlying

Put Options

Sell the underlying

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Option on 3-month EURIBOR Futures Contract (OEU3)

Contract Specifications

Contract standards

Three-Month EURIBOR Futures.

Contract size

One Three-Month Euribor Futures contract.

Settlement

The exercise of an option on the three-month EURIBOR Futures contract results in the creation of a corresponding position in the three-month EURIBOR Futures for the option buyer as well as the seller to whom the exercise is assigned. The position is established after the Post-Trading Full Period of the exercise day, and is based on the agreed exercise price.

Price quotation and minimum price change

The price quotation is in points, with three decimal places. The Minimum Price Change is 0.0025 index points, equivalent to a value of EUR 6.25.

Exercise

American-style; an option can be exercised up to the end of the Post-Trading Full Period (20:00 CET) on any exchange day during the lifetime of the option, and on the last trading day until 11:45 CET for quarterly expiries and 18:00 CET for non-quarterly expiries.

Source: EUREX

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Option on 3-month EURIBOR Futures Contract (OEU3)

Underlying =
1 EURIBOR future

Exercise of the option will take the holder into a...

Long position

Or

Short position

Contract Specifications

Contract standards

Three-Month EURIBOR Futures.

Contract size

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Option on 3-month EURIBOR Futures Contract (OEU3)

Tick value and size
match futures

American-style

Buyer can **exercise at any time** up to and **including the expiry date**

Standard for **exchange-traded interest rate options**

European-style

Bermudan-style

Dominant styles in the **OTC (over-the-counter)** market

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Standard STIR Options and Mid Curves

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STIR options are unusual in offering a **choice of different underlying futures contracts** for a **given expiry date**

Equity Options

Option holder **always** exercises into a **spot position** in the underlying

STIR Options

There is a **choice** to trade:

'Standard'
Exercise into the **adjacent** futures contract

'Mid-curves'
Exercise into a futures contract **further along** the forward curve

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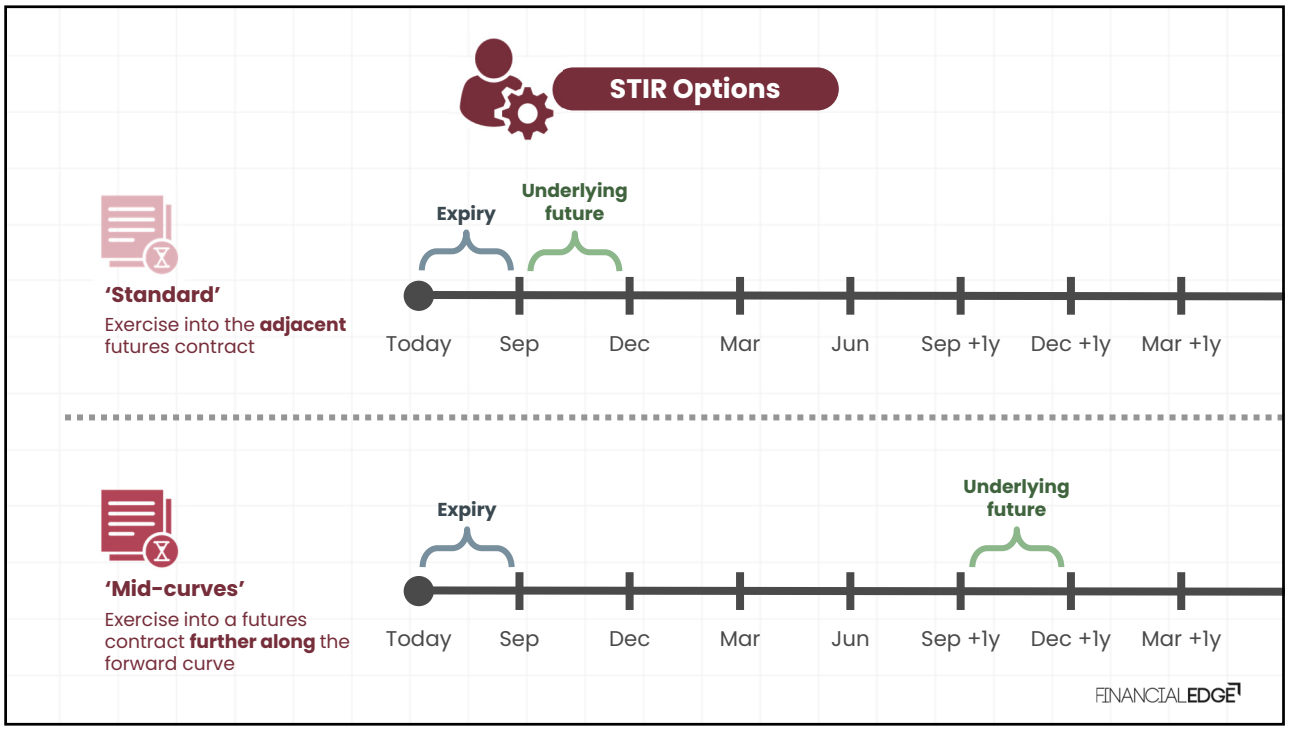

SOFR Options

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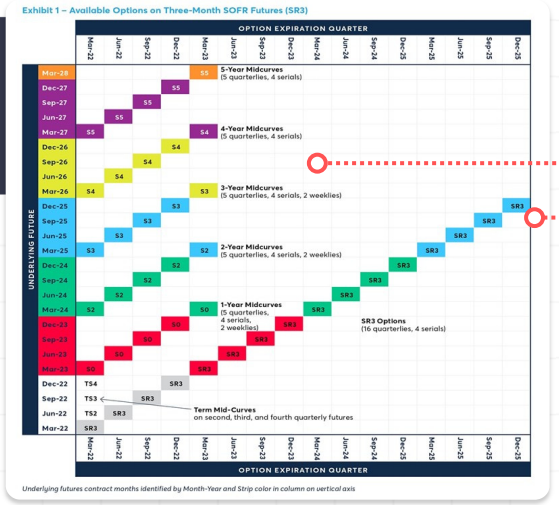
SOFR Options

Why don't we see mid-curve options in other markets?



Mid-curve Options
Underlying x-years **ahead** of the option expiry date

Standard Options
Option expiry date **matches** futures contract date

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Why don't we see mid-curve options in other markets?

Short end

Central bank guides short-term rates

Low volatility in the **front contracts**

Long end

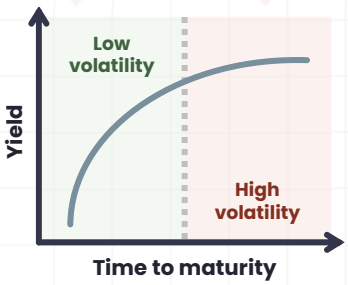
Uncertain future of rates further out

High volatility in **longer-dated futures**

Option trader

Wants options on futures that **move** → Prefers **longer-dated** underlying futures contracts

Wants the **outcome known quickly** → Prefers **shorter-dated** options



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Why don't we see mid-curve options in other markets?

Option trader

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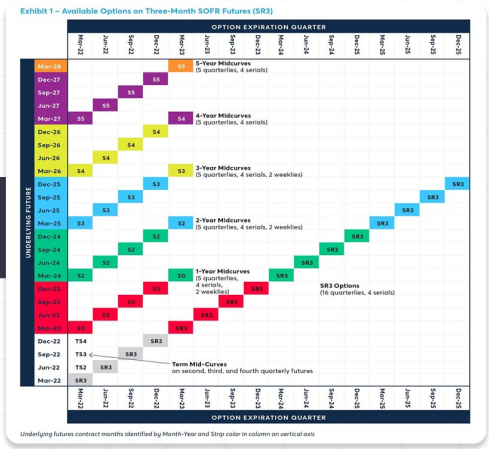
Wants the **outcome known quickly** → Prefers **shorter-dated** options

Mid-curve options
Short expiry on a volatile longer-dated futures contract



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Interest rate options

Central bank sets short-end of futures curve

Futures have **low volatility** at the **short-end** and **high volatility** at the **long-end**

Mid-curve options

Foreign exchange options

No central bank fixing the short-end

All futures tend to be **volatile** across all maturities as spot market moves freely

Equity options

No mid-curve equivalent

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STIR Options Example

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You believe **interest rates will fall**

This means **futures prices will rise**

You want to express this view using a **STIR option**

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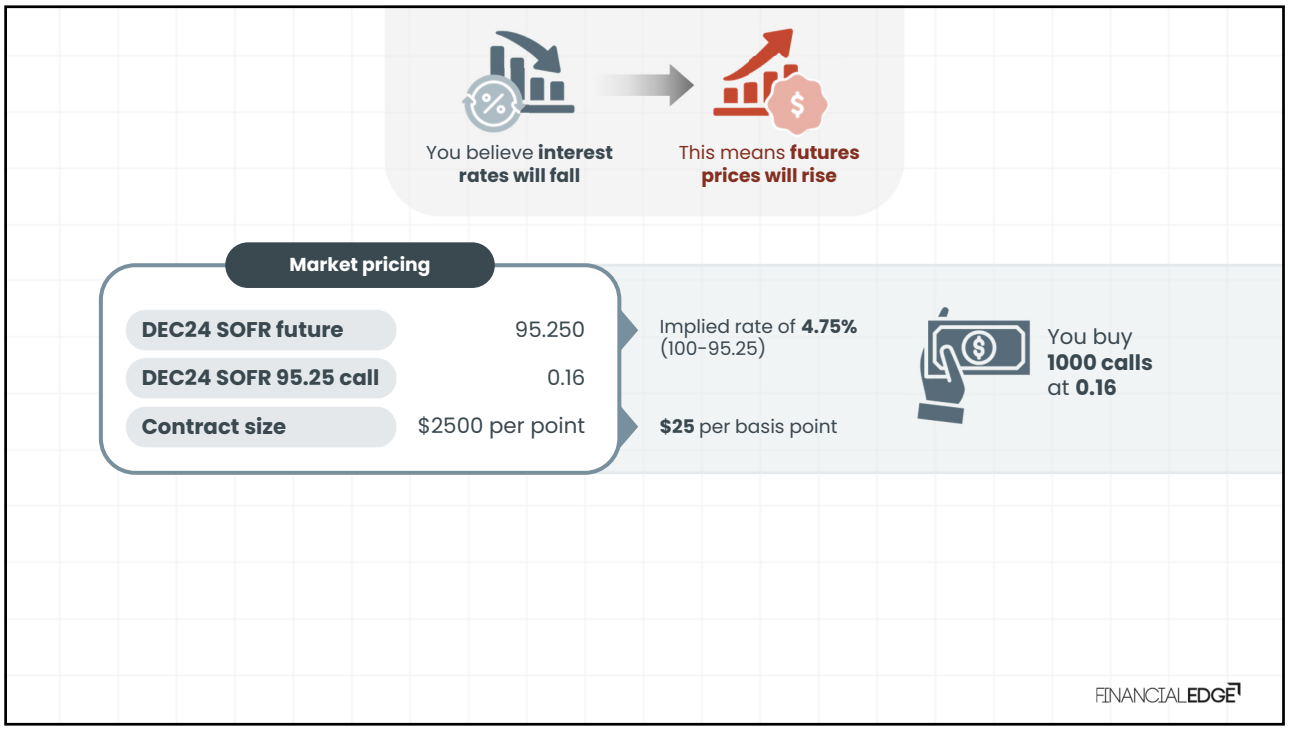

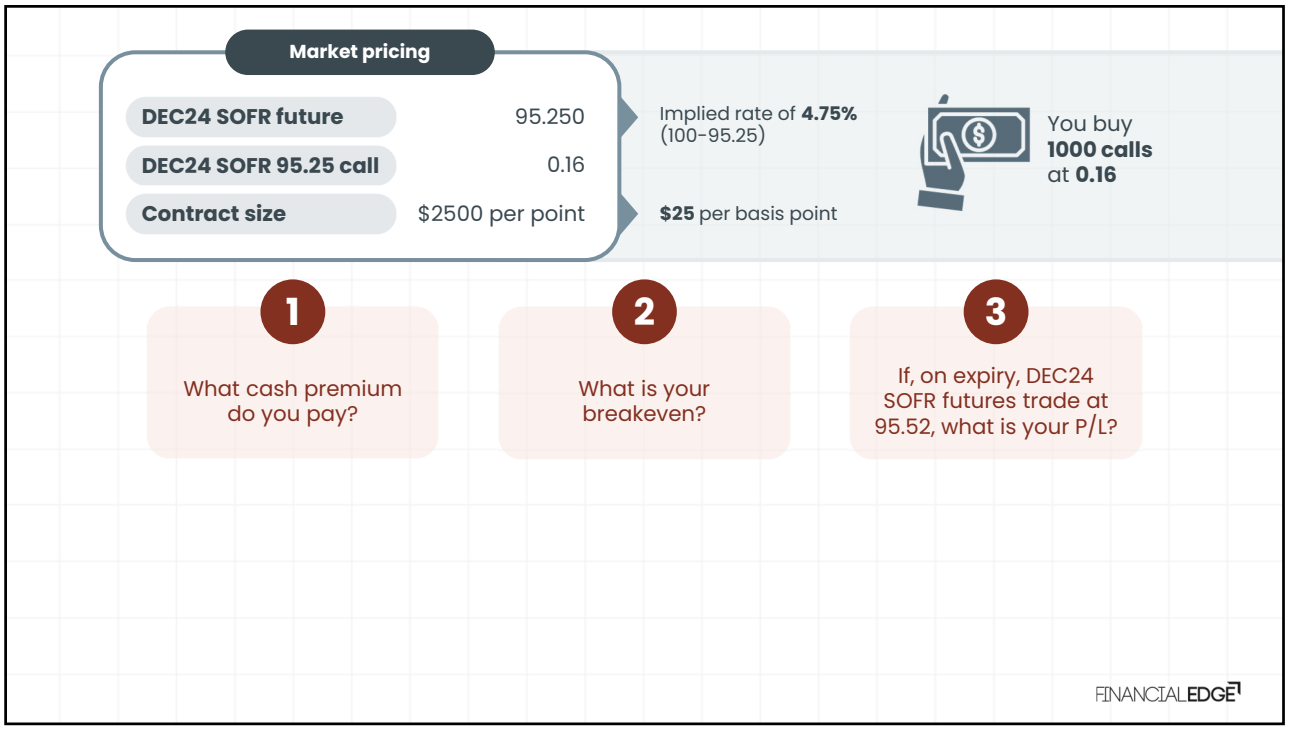

Market pricing

DEC24 SOFR future	95.250
DEC24 SOFR 95.25 call	0.16
Contract size	$2500 per point

Implied rate of **4.75%** (100-95.25)

$25 per basis point

You buy **1000 calls** at **0.16**

1

What cash premium do you pay?

0.16 x $2500 = **$400 per contract**

$400 x 1000 = **$400,000**

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2

What is your breakeven?

95.25 + 0.16 = **95.41**

Implied rate at breakeven of **4.59%**

Ignore discounting effects

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Market pricing

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Implied rate of **4.75%** (100-95.25)

$25 per basis point

You buy **1000 calls** at **0.16**

3

If, on expiry, DEC24 SOFR futures trade at 95.52, what is your P/L?

Future price at expiry | Strike price

Payoff	95.52 - 95.25 = **0.27 points**
Cash payoff	0.27 x $2500 x 1000 = **$675,000**
Net profit	$675,000 - $400,000 = **$275,000**

Method 1

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Market pricing

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$25 per basis point

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3

If, on expiry, DEC24 SOFR futures trade at 95.52, what is your P/L?

Future price at expiry | Breakeven price

Difference	95.52 - 95.41 = **0.11 points**
Net profit	0.11 x $2500 x 1000 = **$275,000**

Method 2

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Caps and Floors

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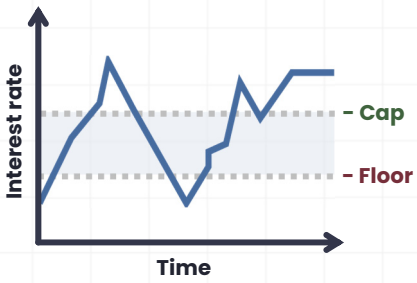
Calls = Caps

Cap the interest hedgers are **paying**

E.g. on a **loan**

In the **OTC market options on short interest rates** are called...



E.g. on a **floating-rate note**

Put a floor under the interest hedgers are **receiving**

Floors = Puts

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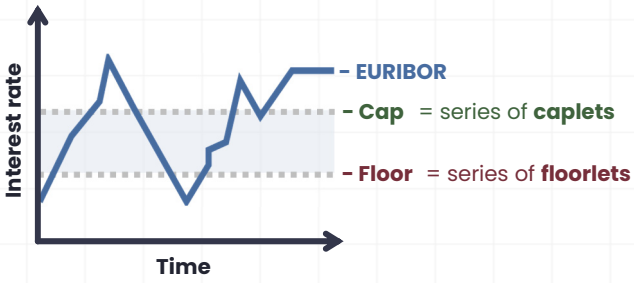

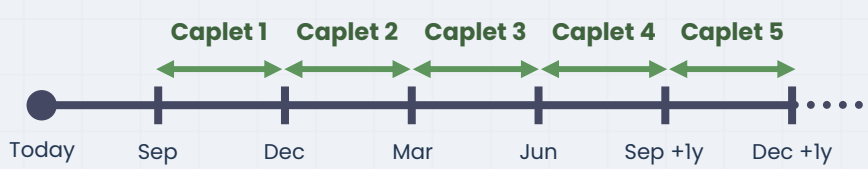

Caplets operate **independently**

Producing a **payoff** if **EURIBOR fixes above the strike** (call option)

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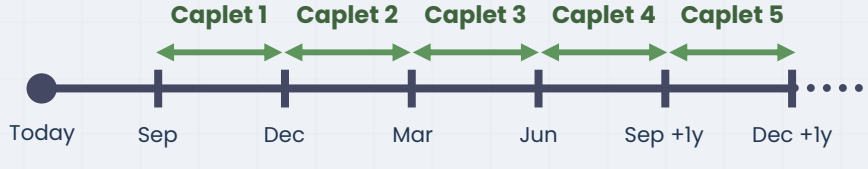

Caplets operate **independently**

Producing a **payoff** if **EURIBOR fixes above the strike** (call option)

Payoff is **pro-rated** for the interest period by using a **day count fraction:**

Caplet payoff $= \mathrm{MAX}(\mathrm{R}_{\mathrm{expiry}} - \mathrm{Strike}, 0) * \frac{\mathrm{days}}{\mathrm{basis}}$

Floorlet payoff $= \mathrm{MAX}(\mathrm{Strike} - \mathrm{R}_{\mathrm{expiry}}, 0) * \frac{\mathrm{days}}{\mathrm{basis}}$

Payoffs are **cash settled at the end** of their interest periods

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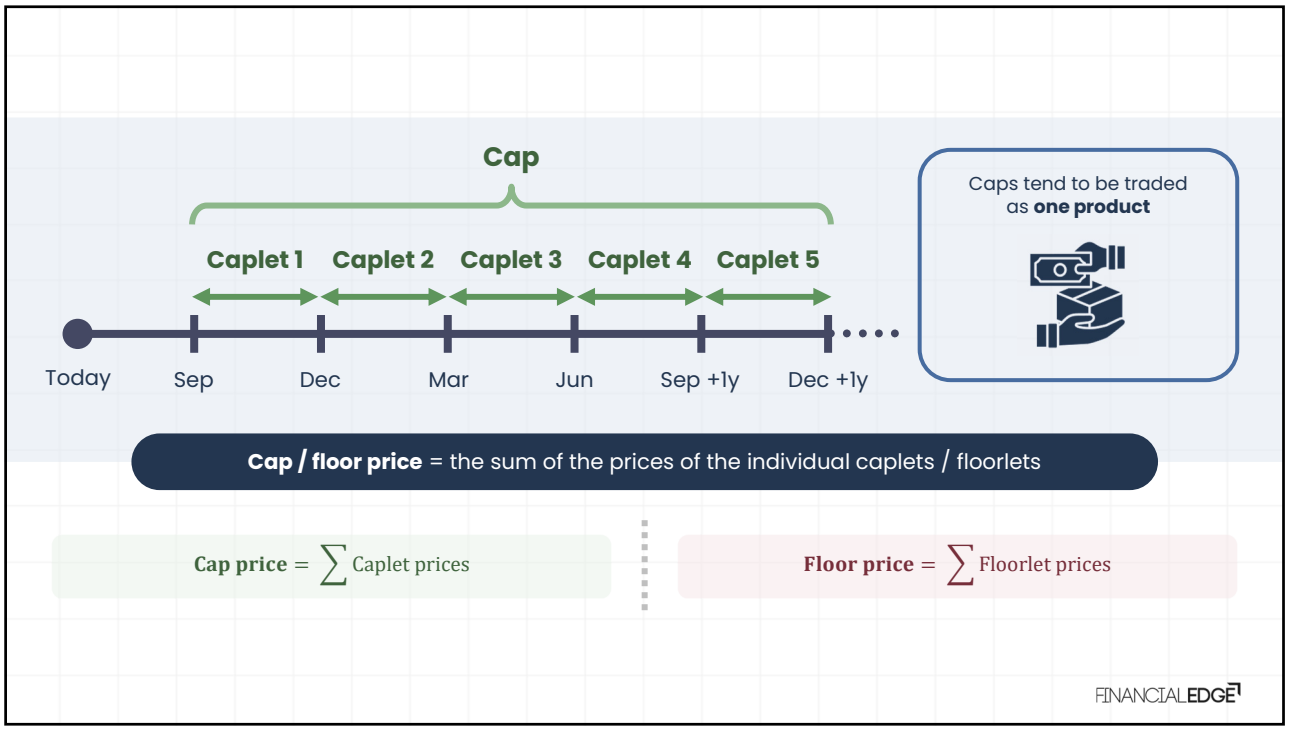

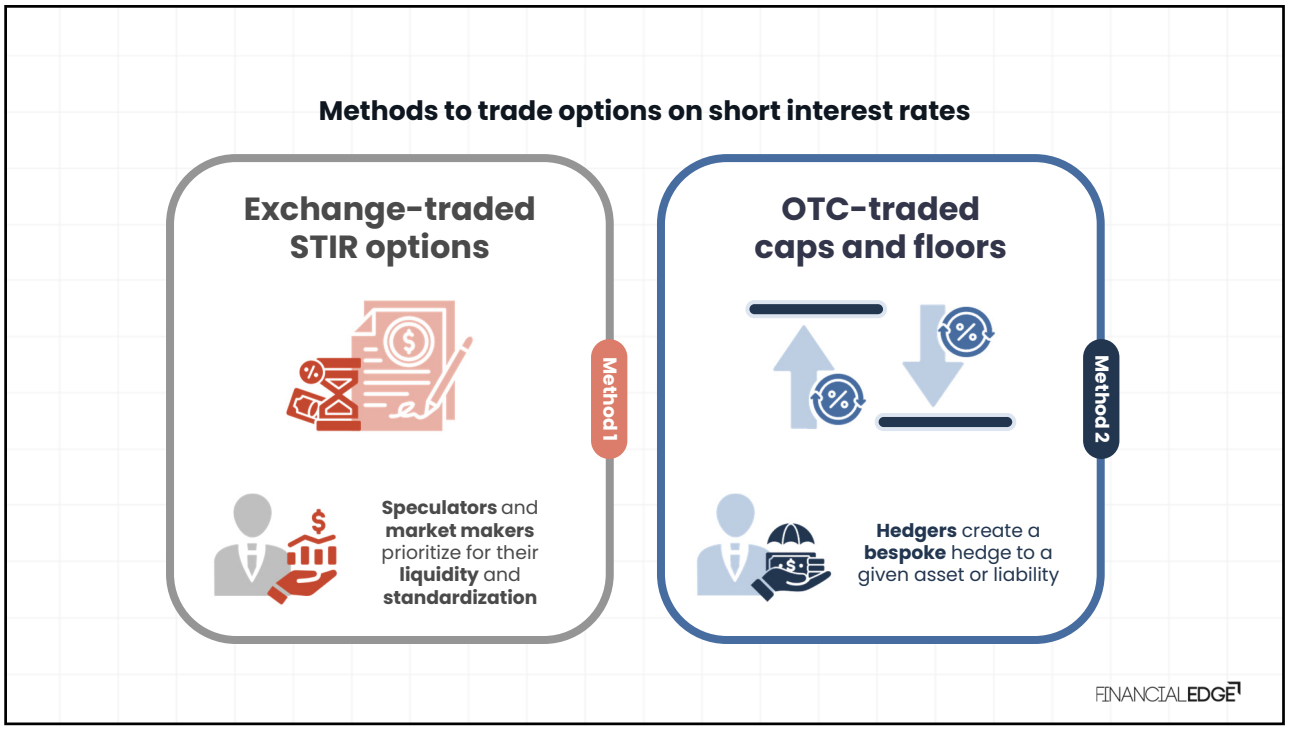

Cap Hedge

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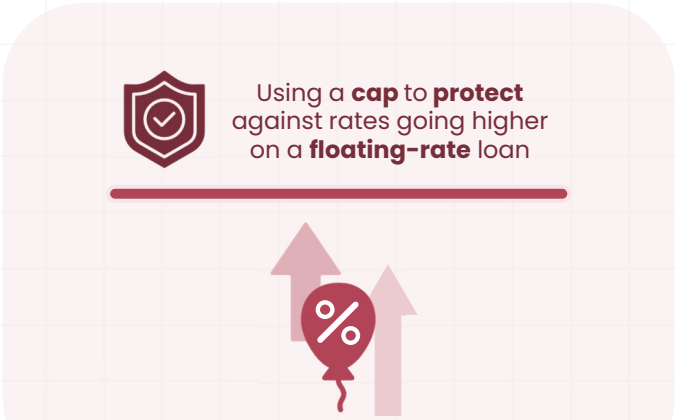

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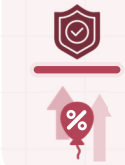
A company borrows for **5 years** at **6-month EURIBOR + 150 bps**
They want to **lock-in** a worse-case scenario for their **loan rate**



5y swap	PV01
2.65%	4.625

Cap strike	Premium	Premium (bppa)	Spread	Loan cap
3.00%	1.85%	0.40%	1.50%	4.90%
4.00%	1.23%	0.27%	1.50%	5.77%
5.00%	0.91%	0.20%	1.50%	6.70%

Cap strike increases

Premium decreases

Higher-strike caps will offer **reduced protection**

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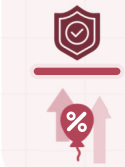

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Premium can be quoted

Upfront

In bppa

(BPPA: basis points per annum)

$$\frac{\text{Premium}}{\text{PV01}}$$

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Premium can be quoted

In bppa

$$\frac{\text{Premium}}{\text{PV01}}$$

Spreads the cost of cap over life of loan

Represents premium as **increase in effective borrowing cost**

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Buyer could either pay

Upfront

123 bps

In bppa

27 bps per year for 5 years

FINANCIALEDGE

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If EURIBOR fixed **above 4%**

Caplets would produce **positive payoffs**

Cost of borrowing = strike + spread + premium bppa

5.77% = 4% + 1.5% + 0.27%

Maximum all-in rate capped at 5.77%

FINANCIALEDGE

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Pay fixed at **2.65%**

Locking in an all-in fixed rate of **4.15%** (2.65% + 1.50%)

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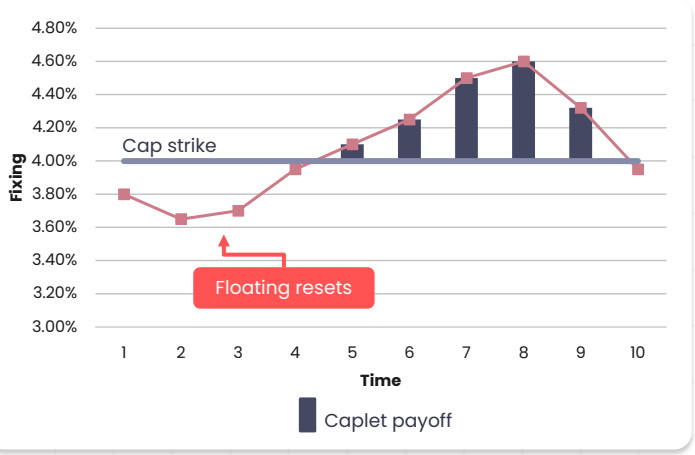
Hedging company **buys 4% cap**

Caplets operate **independently**

Producing a **payoff** if **EURIBOR fixes above the strike** (4% cap)



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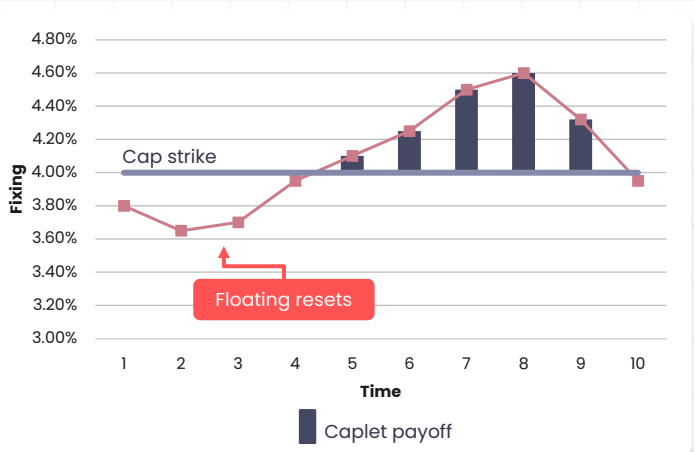
Hedging company **buys 4% cap**

Fixing	EURIBOR	Cap payoff	Loan rate
1	3.80%	0.00%	5.57%
2	3.65%	0.00%	5.42%
3	3.70%	0.00%	5.47%
4	3.95%	0.00%	5.72%
5	4.10%	0.10%	5.77%
6	4.25%	0.25%	5.77%
7	4.50%	0.50%	5.77%
8	4.60%	0.60%	5.77%
9	4.32%	0.32%	5.77%
10	3.95%	0.00%	5.72%



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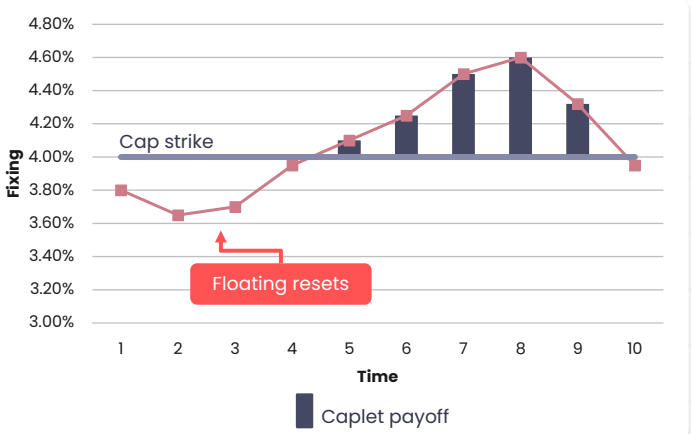

EURIBOR fixes **below 4%**

No caplet payoff is produced

Loan interest

EURIBOR + 1.50% + 0.27%

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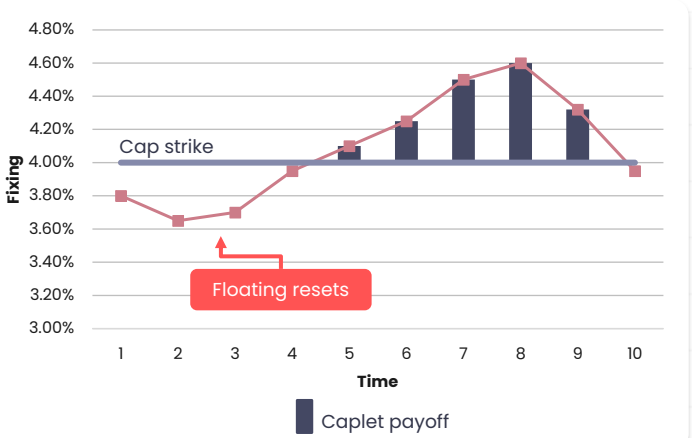

EURIBOR fixes **above 4%**

Caplet payoff **nets** the EURIBOR component **back to 4%** → Ensuring the loan rate **cannot exceed 5.77%**

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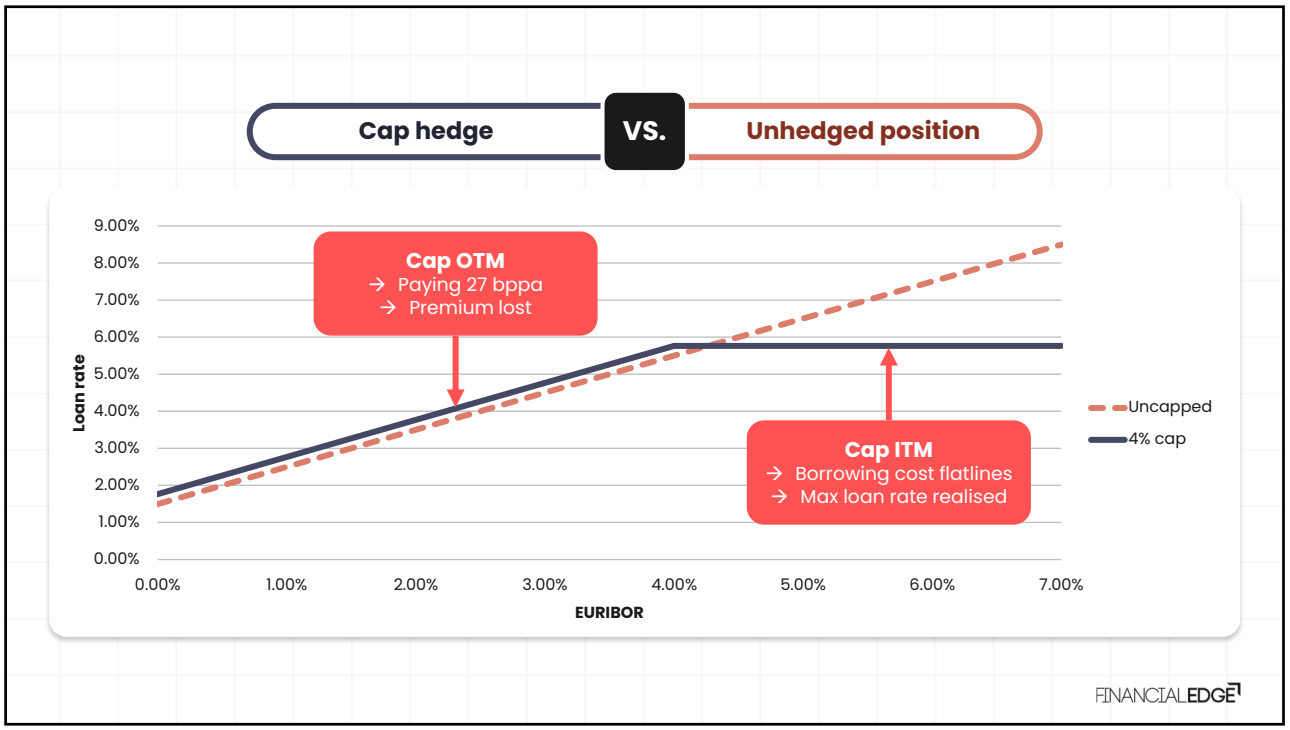

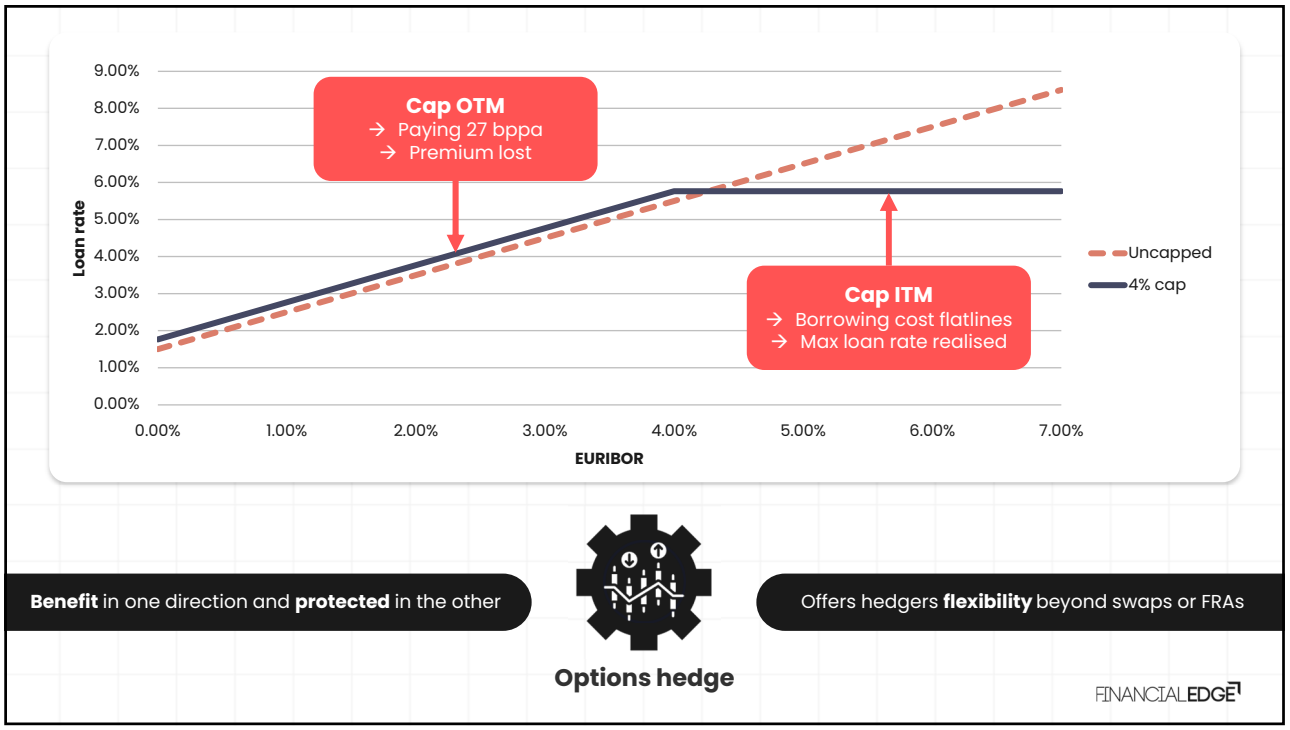

Cap and Floor Date Terminology

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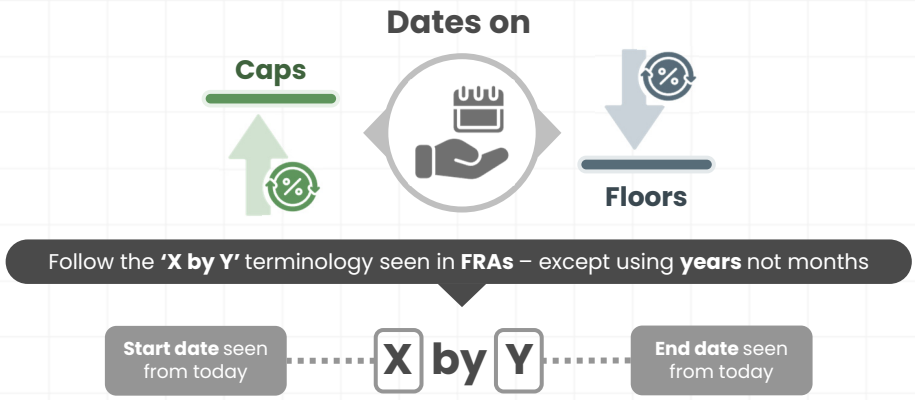

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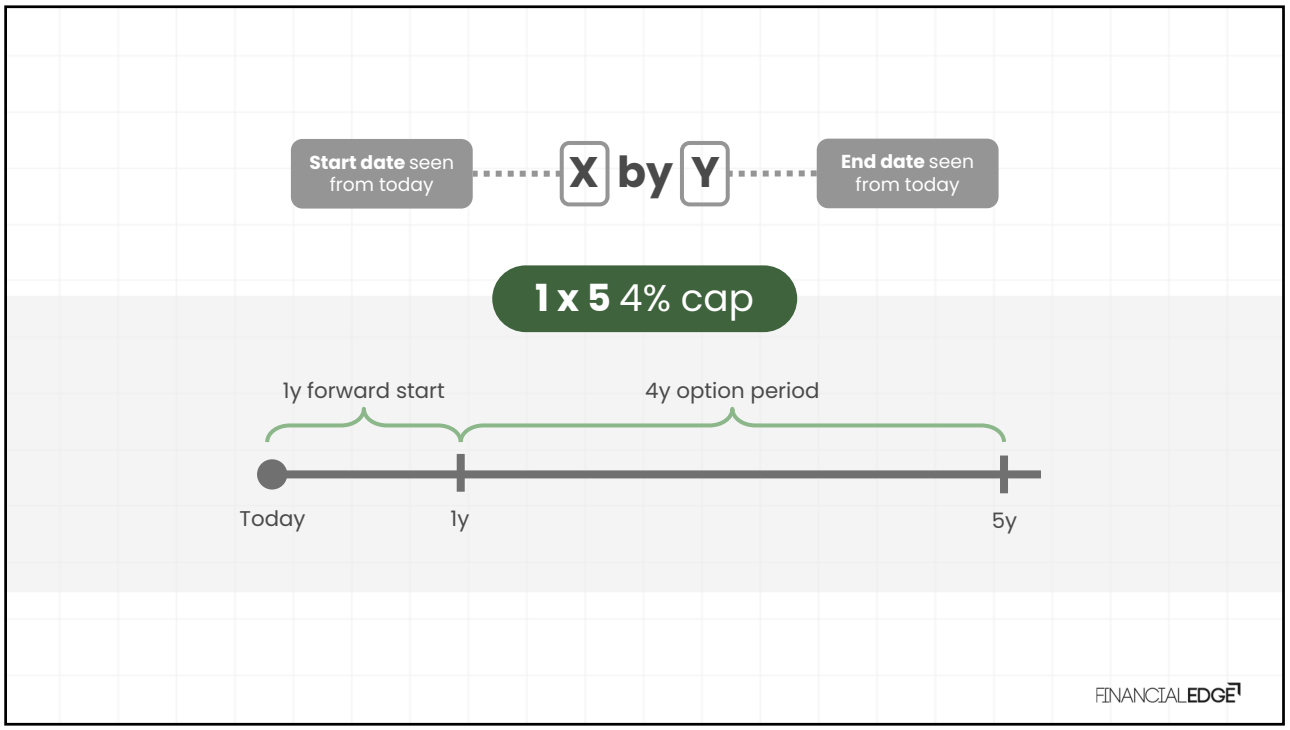

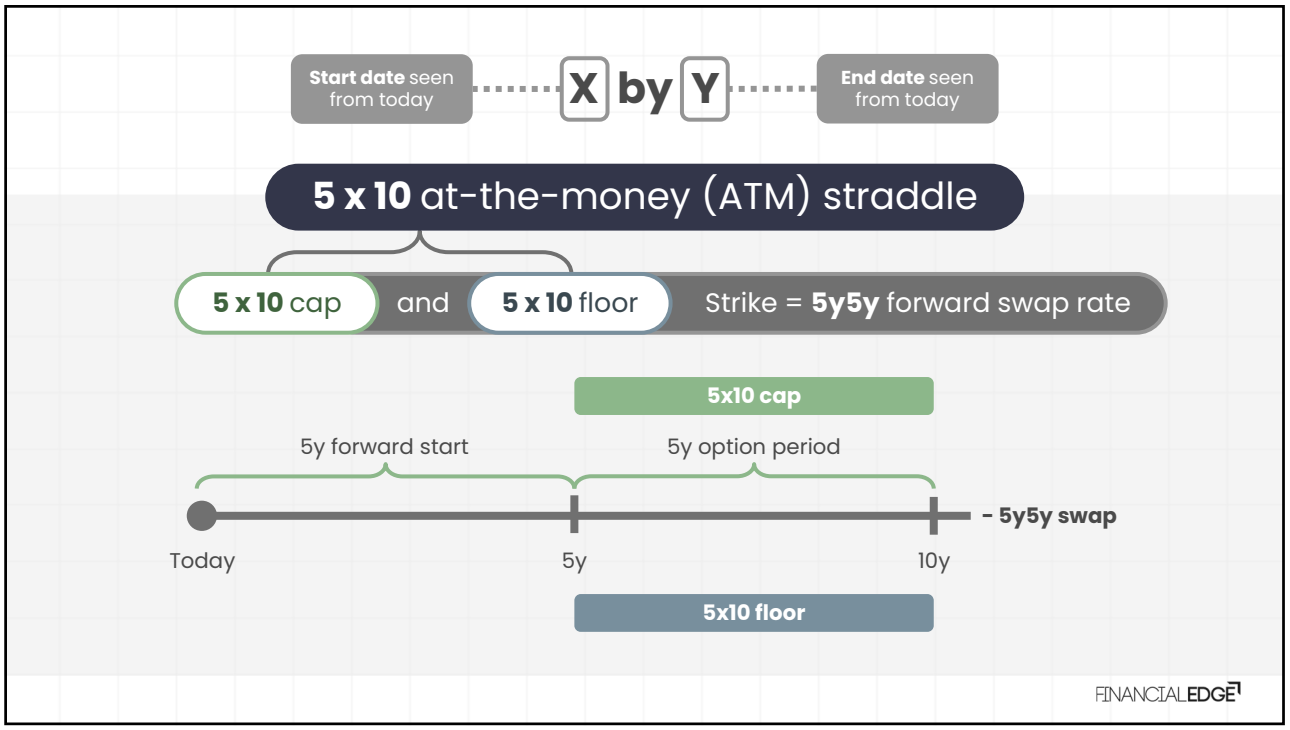

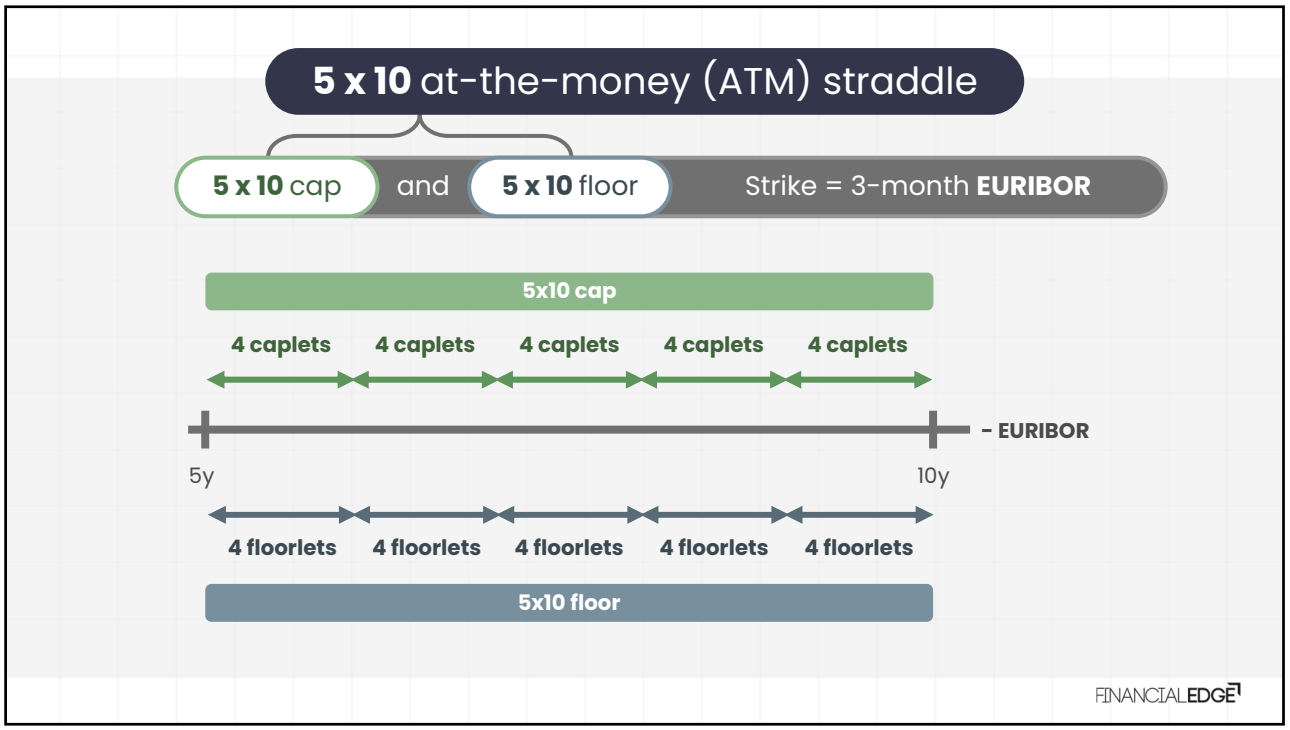

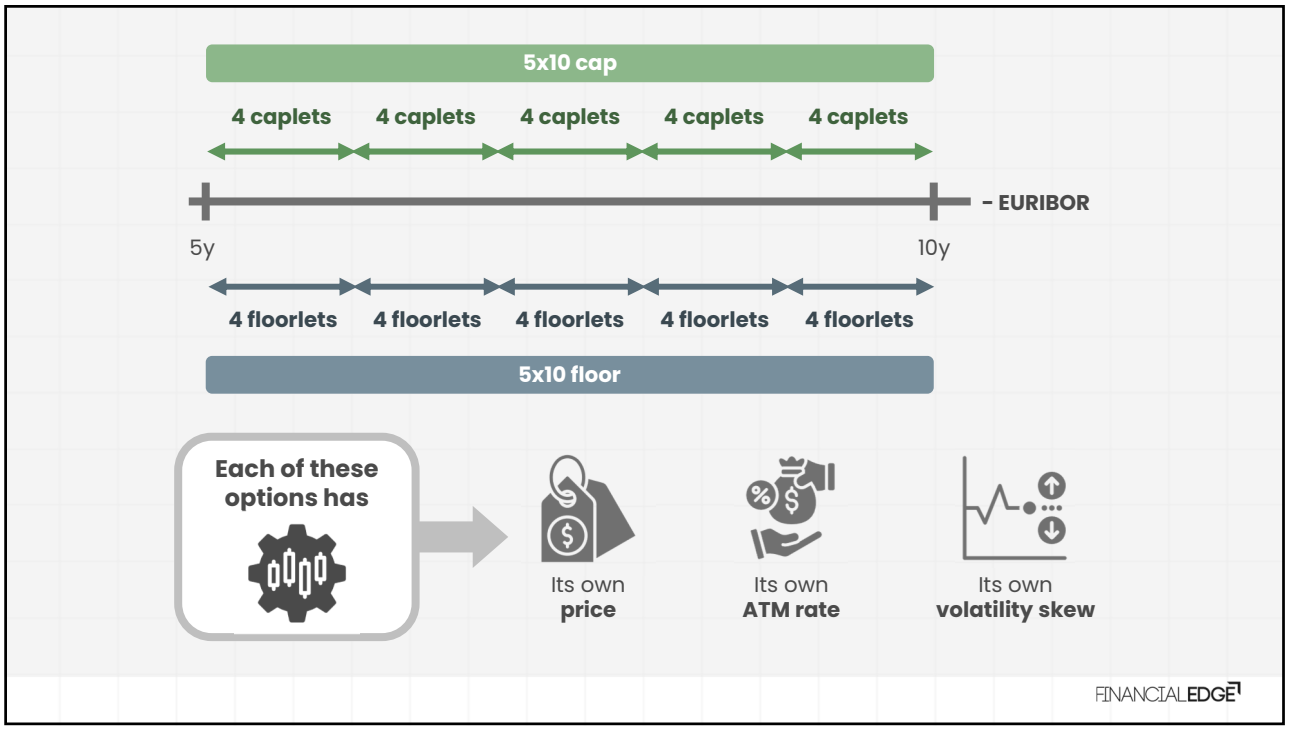

Collars

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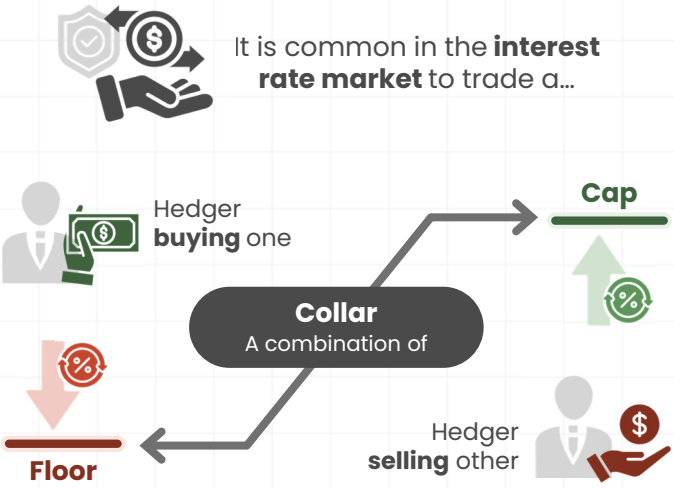

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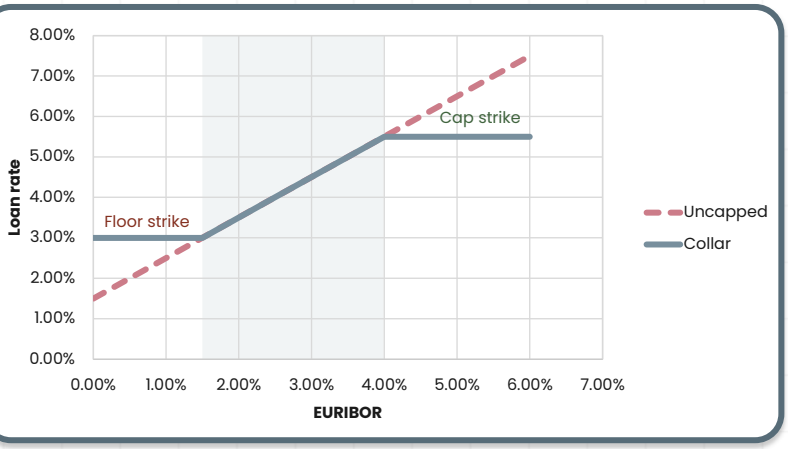
4% vs. 1.5% cap floor collar

Net zero premium

Hedger has **nothing to pay upfront**

EURIBOR between 1.5% and 4%

Borrowing costs move **up and down with EURIBOR**



FINANCIALEDGE

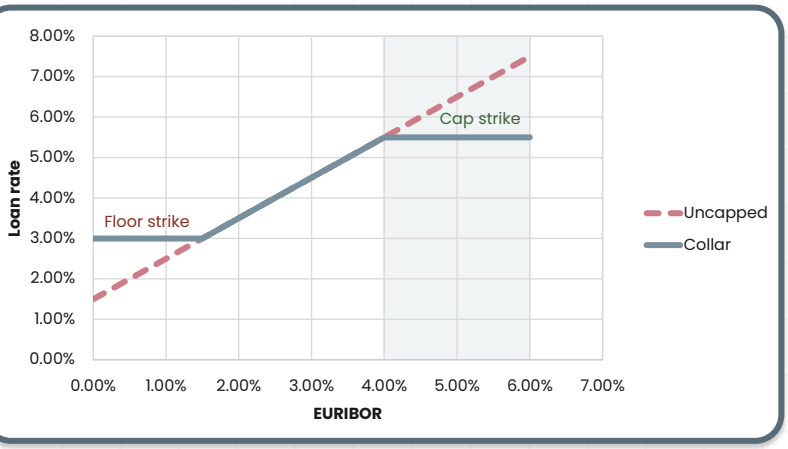
4% vs. 1.5% cap floor collar

Net zero premium

Hedger has **nothing to pay upfront**

EURIBOR rises above 4%

Hedger is **protected** – borrowing costs are **capped at 5.5%**



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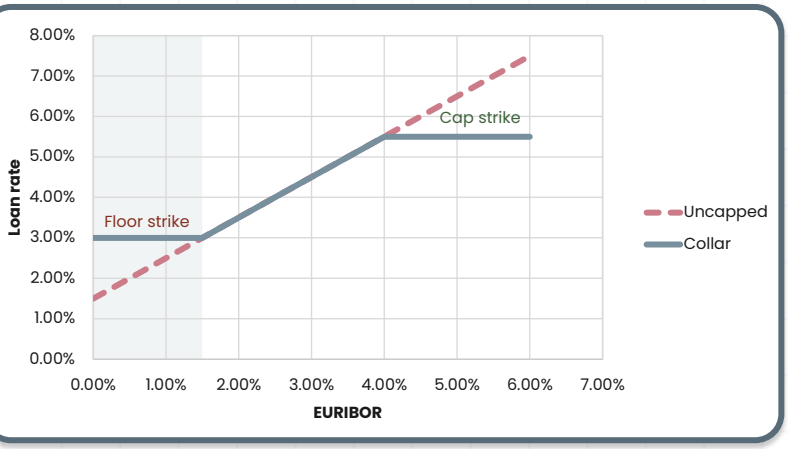
4% vs. 1.5% cap floor collar

Net zero premium

Hedger has **nothing to pay upfront**

EURIBOR falls below 1.5%

Hedger **loses benefit** – borrowing costs are **floored at 3%**



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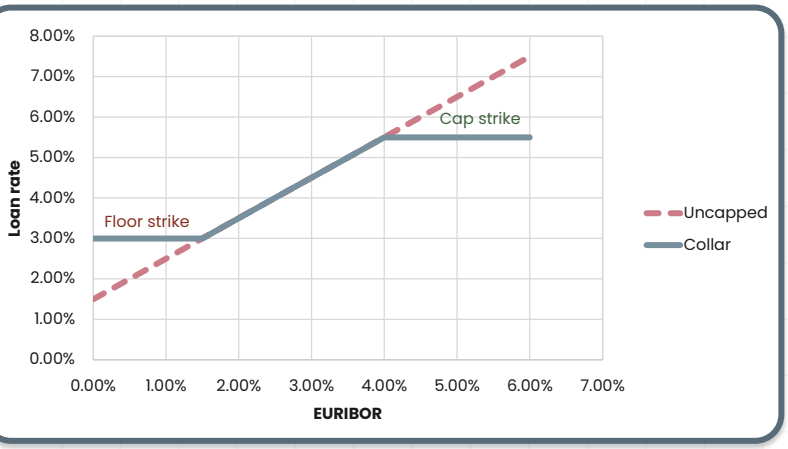
4% vs. 1.5% cap floor collar

Net zero premium

No cash premium

Cap protection is "paid for" by **giving up potential gains** if EURIBOR drops below the floor (1.5%)

Zero-premium collars are attractive to **non-financial counterparties** who **do not have large cash reserves** to spend on **option premiums**



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Cap and Floors on RFR Rates

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Caps and floors on RFRs

SOFR or SONIA

Payoff at expiry is **based on the RFR** over the **interest period** (compounded average)

SOFR caplet/floorlet

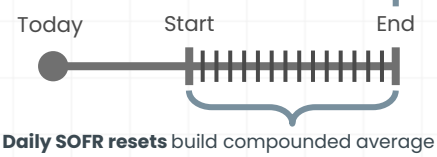
Expiry

Caplets and floorlets longer time to expiry

↳ RFR term rate is known at end of the period

Options become 'average rate' or 'Asian'

↳ Pricing is slightly more complex and less transparent for some hedgers



Daily SOFR resets build compounded average

Term SOFR caplet/floorlet

Expiry

Hedge with a cap or floor which references that term RFR

↳ Operate the same as EURIBOR cap/floor

↳ Single fixing of the rate at start of the period (no daily resets)

Term SOFR reset

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Swaptions

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Swaptions

Options on swaps

The right to enter into a **swap** as either the **payer** or **receiver** of the fixed leg

Payer swaption

(Call option on swap rate)

Right to **pay** fixed

Swaptions let traders **hedge or speculate** on **long-term rate** moves, for example **10-year swaps**

Receiver swaption

(Put option on swap rate)

Right to **receive** fixed

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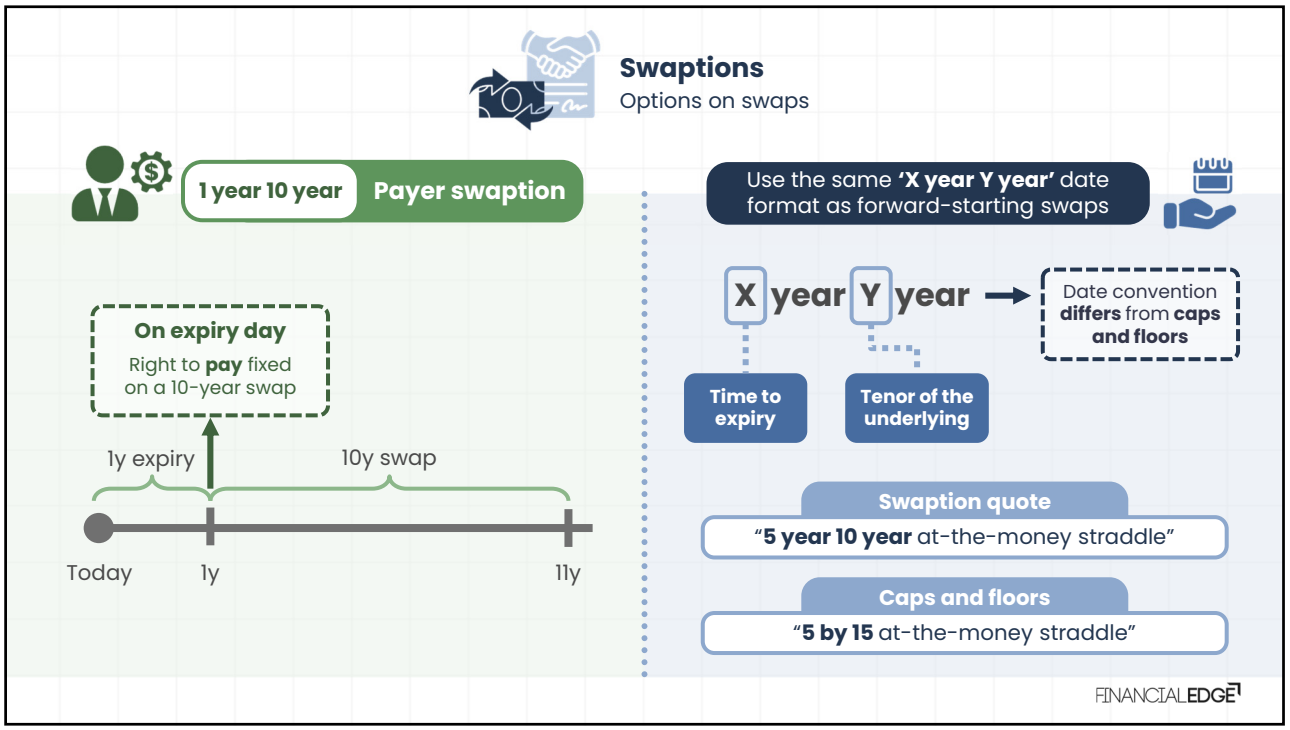
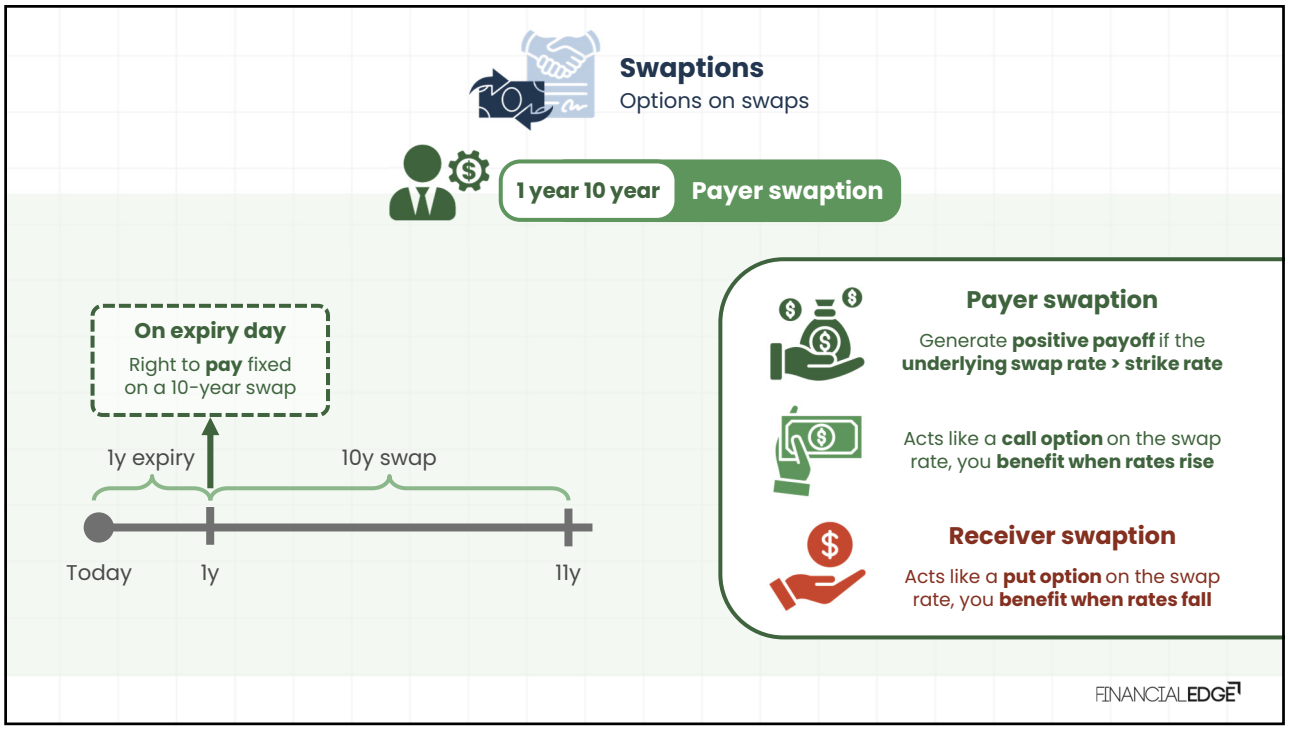
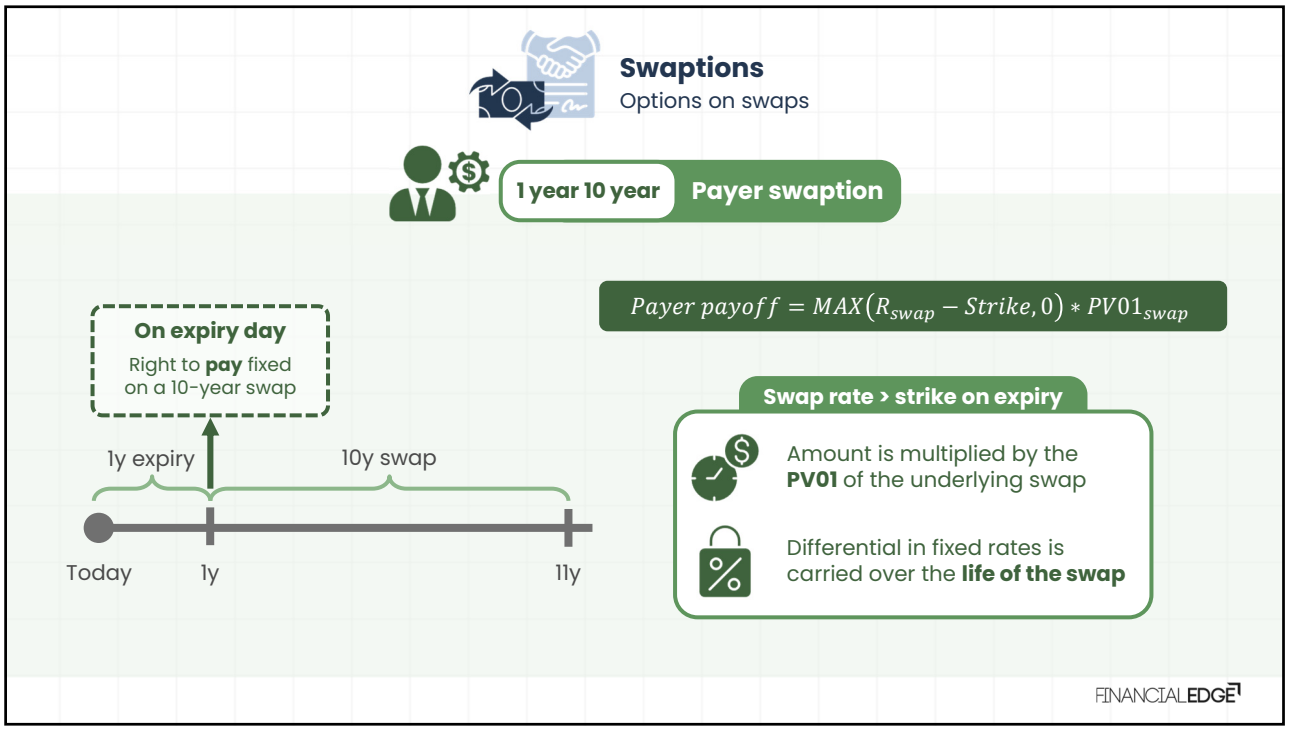
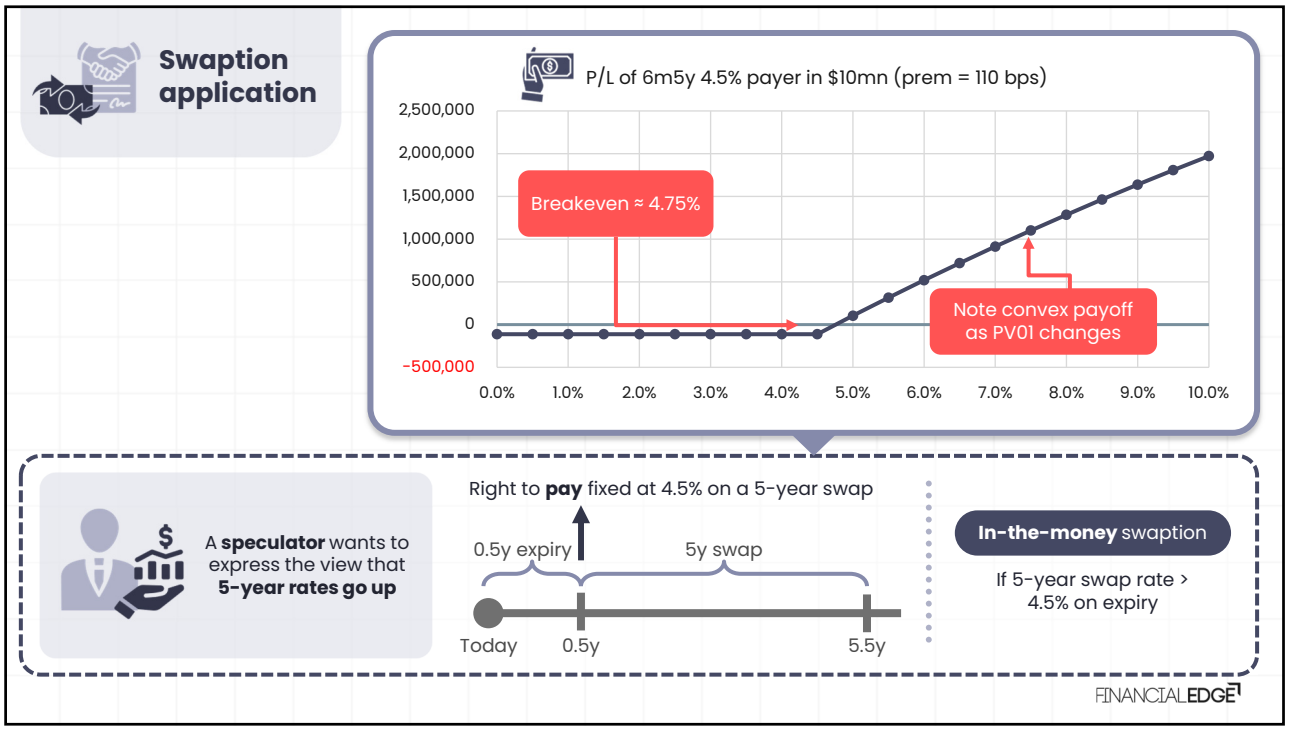
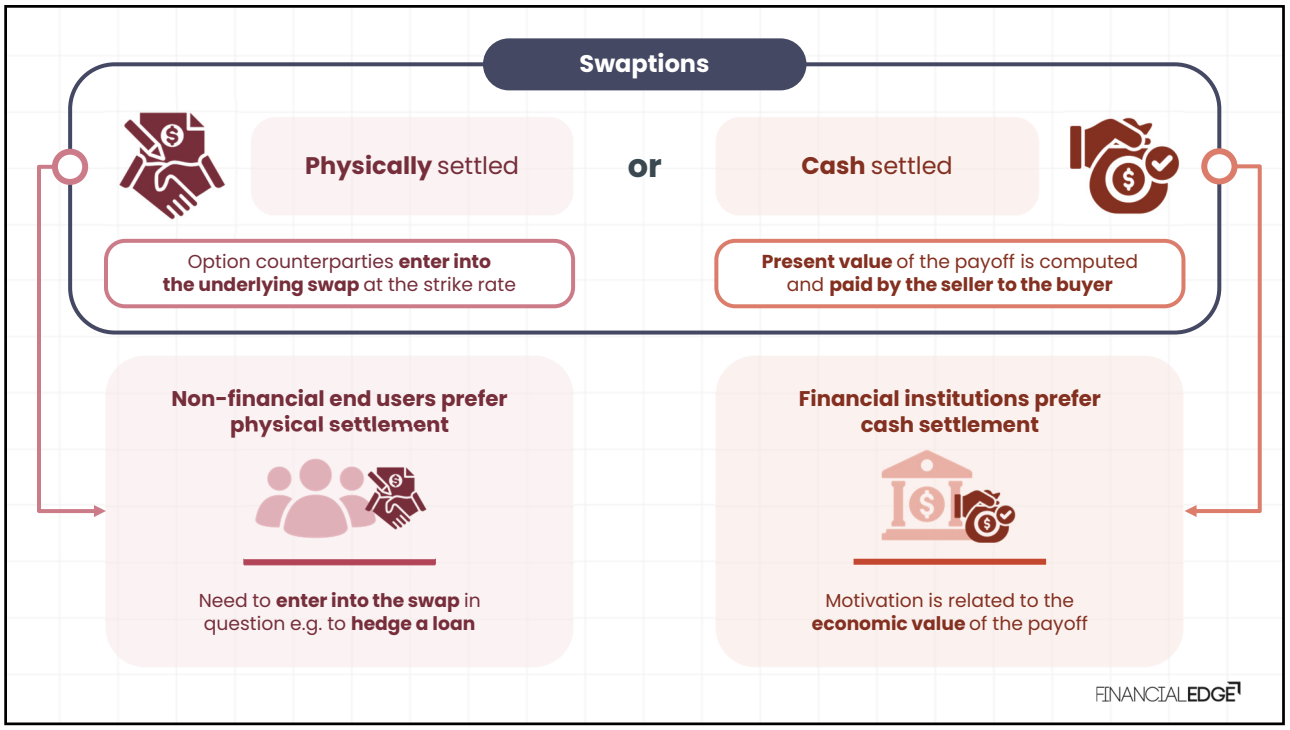


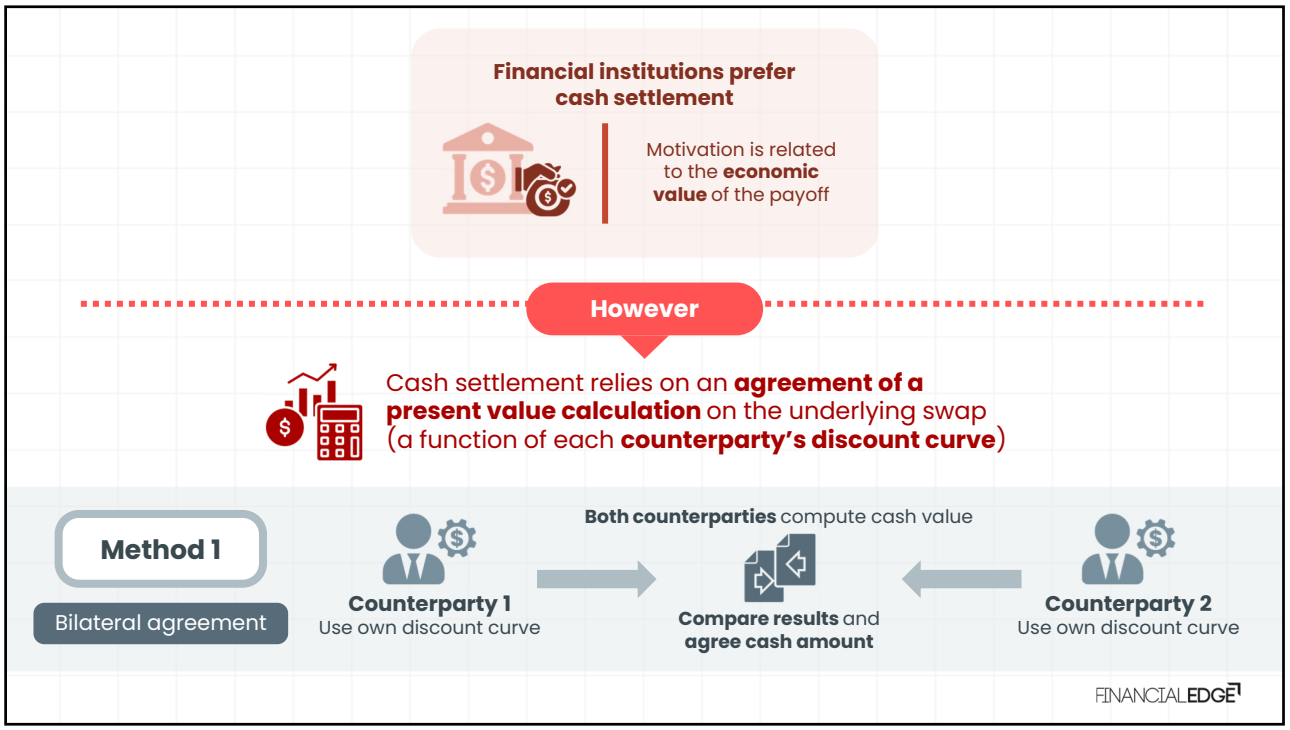


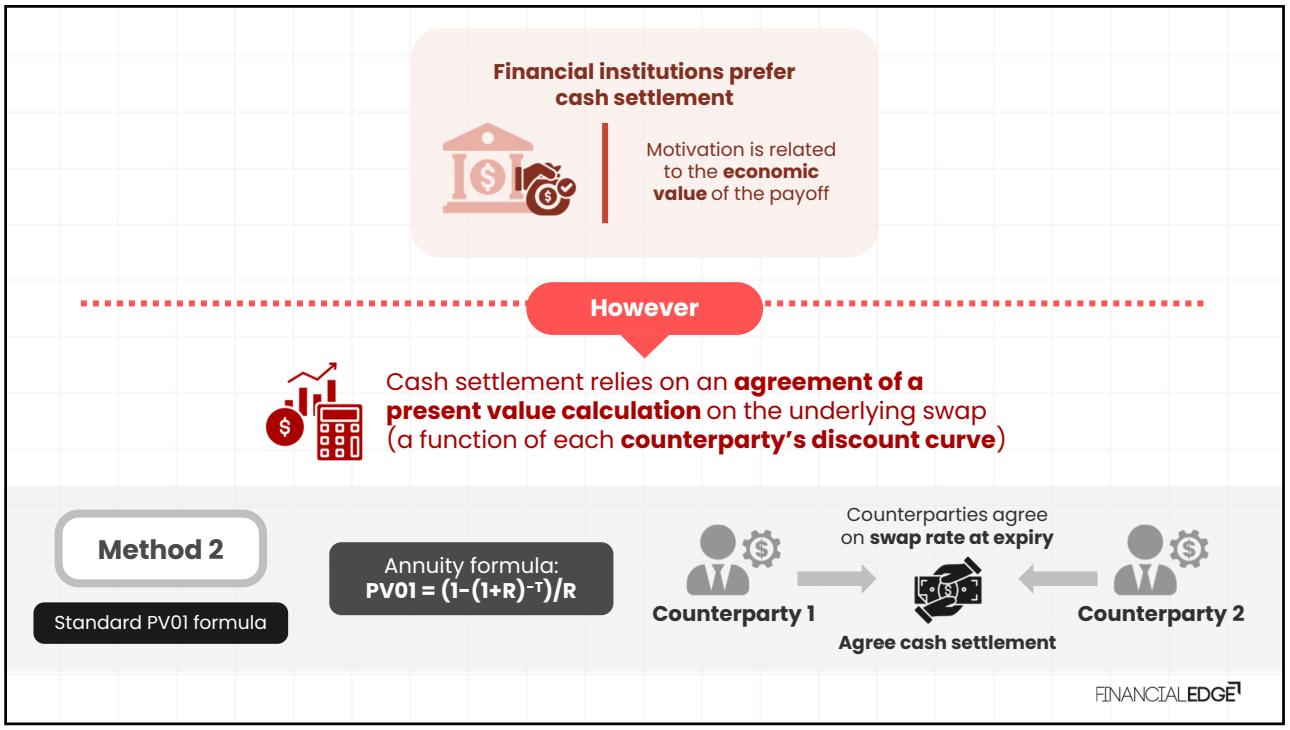


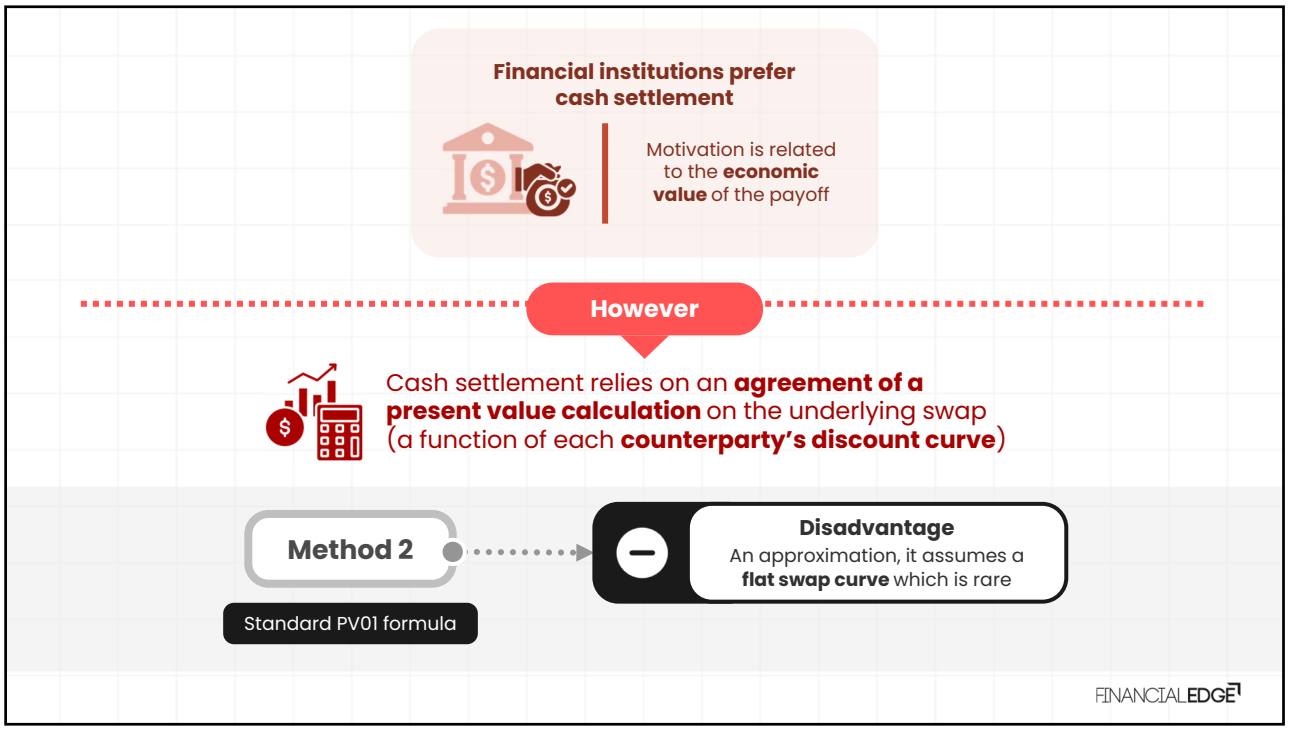
Swaption Settlement and Example











Swaption Speculative Applications

1

Directional trading

e.g. use a **payer swaption** to express a view that **swap rates go higher**

A speculator could trade a **compound view**

EXAMPLE

View = **rates decrease** + View = **volatility increases**

Buy receiver swaption

"Double win" = both results **increase the price** of the receiver

You **can't** do this with **one-dimensional swaps**, only swaptions
(swaps only react to rate moves)

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2

Payer and receiver spreads

Traders often **combine swaptions** together to create a **more complex speculative view**

Payer and receiver spreads – used to **reduce upfront premium** of a **directional view**

Payer spread

Buy low strike payer + **Sell high strike payer** = **Reduction in premium**

Moderately **bearish** view on rates → Rates going up, bond prices going down

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3

Straddles and strangles

Payer swaptions + **Receiver swaptions** — Used to **trade volatility** rather than direction

EXAMPLE

Trader thinks **volatility will decrease.**
They could express this view through:

Short straddle or **Short strangle**

'Butterflies' and **'condors'**

Created by **combining straddles** and **strangles**

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4

Price distribution

Fat-tailed | **Skewed**

Using:

Butterflies and **Risk reversals** — Long payer vs short receiver (or vice versa)

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5

Market structure

Foreign exchange or **equities**

All expiries share the same underlying

Swaptions

Matrix of available expiries and **underlying's**

Liquid expiries / swap tenor

1m, 6m, 1y, 2y, 5y, 10y → 6m5y, 1y10y, 5y5y

Less liquid 7y2y

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Flattening Trade Example

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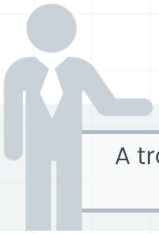
Swaptions can be used in **steepening** and **flattening trades**



A trader can use swaptions to add an **extra parallel curve** element, or **'conditional curve trade'**

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A trader can use swaptions to add an **extra parallel curve** element, or **'conditional curve trade'**

2-year vs. 10-year ⟶ +25 bps

Using swaps, a trader expressing a **curve flattening view** would:

Sell the spread at +25 bps

Pay fixed 2y

Receive fixed 10y

(delta neutral sizes)

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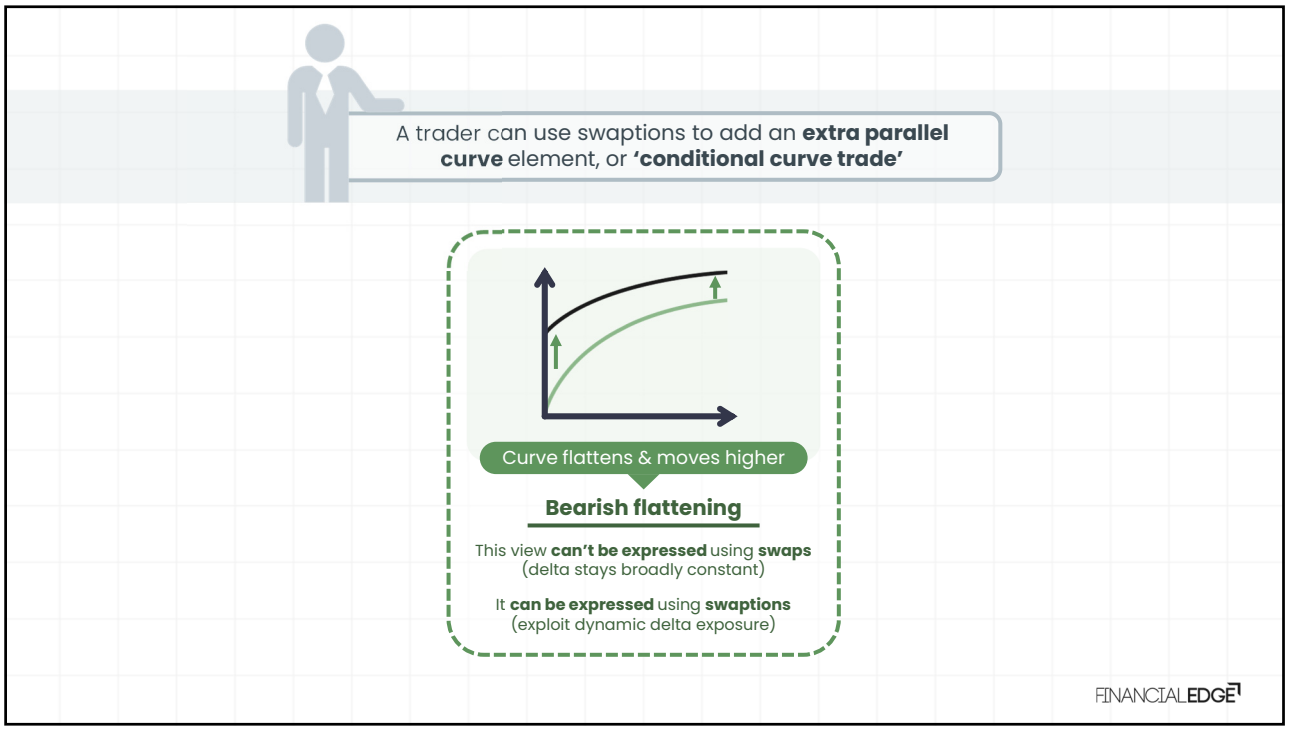

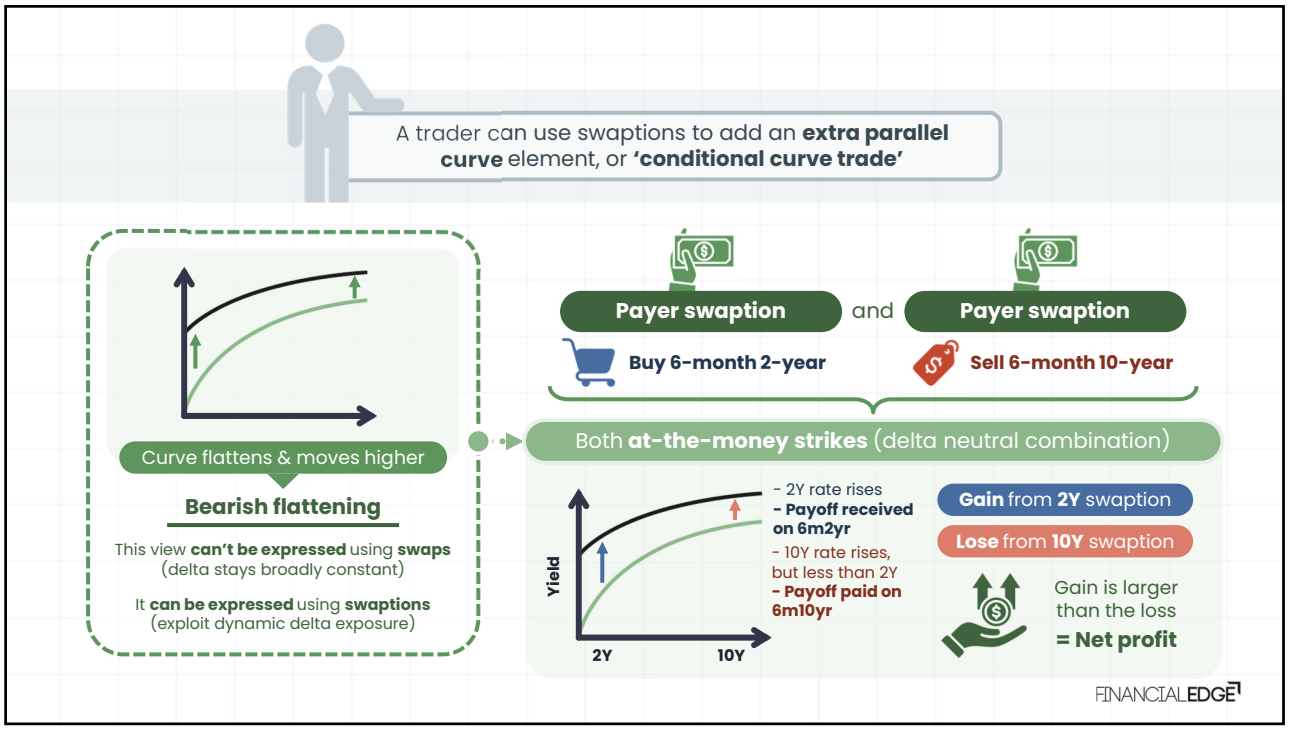

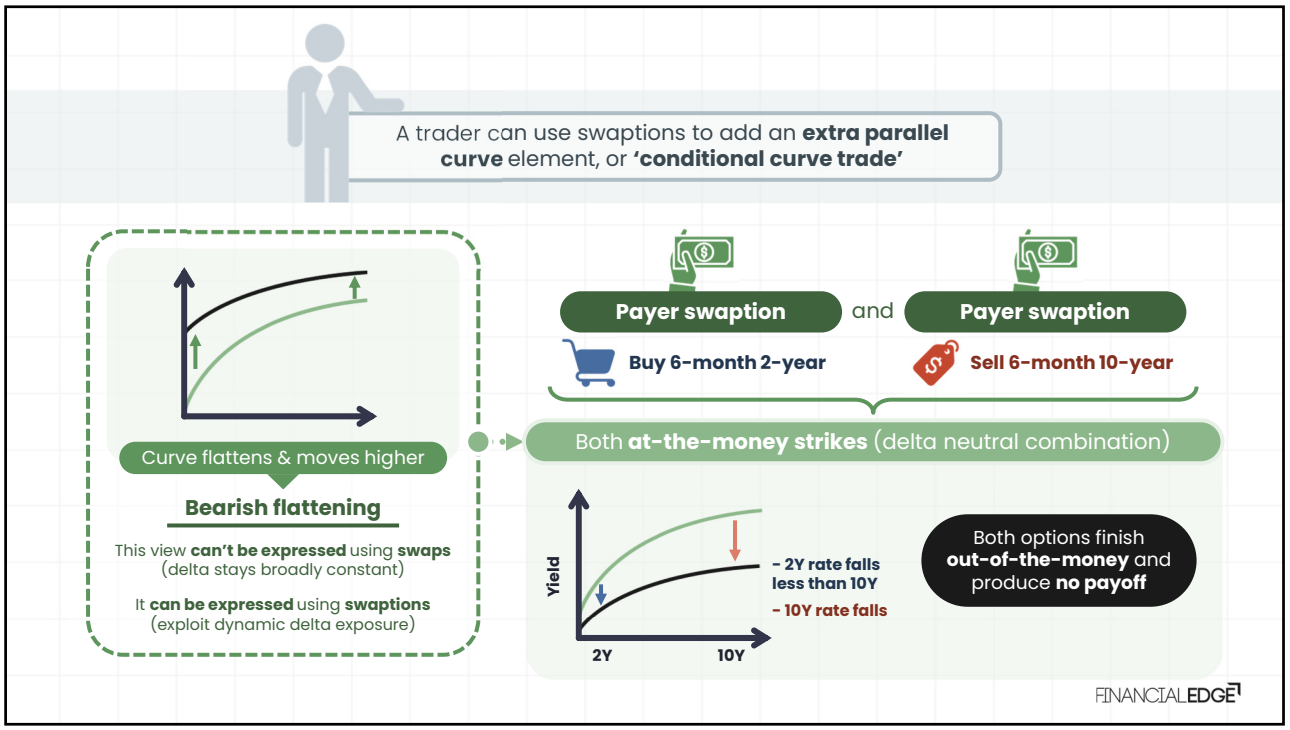

Conditional Curve Trades

Conditional curve trades

We always trade the **same type of swaption** – either two payers or two receivers.

The combination is sized to be **delta-neutral on trade date.**

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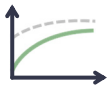
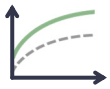
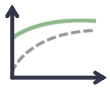
Conditional curve trades

Graph	View	Description	Trade
	Bearish flattening	Curve expected to flatten driven by an increase in yields on short tenors	• Buy short tenor payer • Sell long tenor payer
	Bearish steepening	Curve expected to steepen driven by an increase in yields on long tenors	• Sell short tenor payer • Buy long tenor payer
	Bullish flattening	Curve expected to flatten driven by a fall in yields on the long tenors	• Sell short tenor receiver • Buy long tenor receiver
	Bullish steepening	Curve expected to steepen driven by a fall in yields on the short tenors	• Buy short tenor receiver • Sell long tenor receiver

EXAMPLE

Bullish steepening view

Receiver swaption

Buy 1-month 10-year

+

Receiver swaption

Sell 1-month 30-year

Both **at-the-money strikes**

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Conditional curve trades

Why use swaptions instead of simple swaps?

1

Ability to express a **richer view**

"I think if rates increase the curve will flatten, however if rates decrease the curve may steepen or remain the same shape"

With **swaps**, you can only trade **curve shape**

With **swaptions**, you can isolate the bearish flattening outcome **without being exposed to losses** if the opposite (bullish steepening) occurs

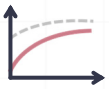
2

Exploiting the **volatility surface**

Creates opportunities to:

- Improve initial curve spread entry level
- Net receive premium on trade inception

Bearish flattener



- 10Y swap tenor volatility > 2Y swap tenor volatility
- **Buy lower-vol and sell higher-vol**
- Improve option strikes to create **in-the-money** starting position

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Bermudan Swaptions

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Bermudan swaptions

Options that can be exercised once, but on a **choice of multiple predetermined discrete expiry dates**

Popular in the **interest rate market**

Their multiple expiry dates can be **matched against the payment dates** of **bonds** or **swaps**

Creating:

- **'Callable'** structures
- **'Puttable'** structures

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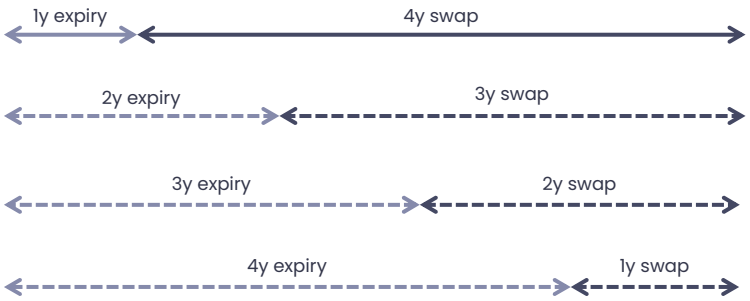
Bermudan swaptions

Traded on **'co-terminal'** underlying swaps

i.e. any swap the option is exercised into shares the **same maturity date**

5-year 'no-call' 1-year annual exercise (5ncl)



As the **exercise gets longer**, the underlying **swap gets shorter**

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Bermudan swaptions

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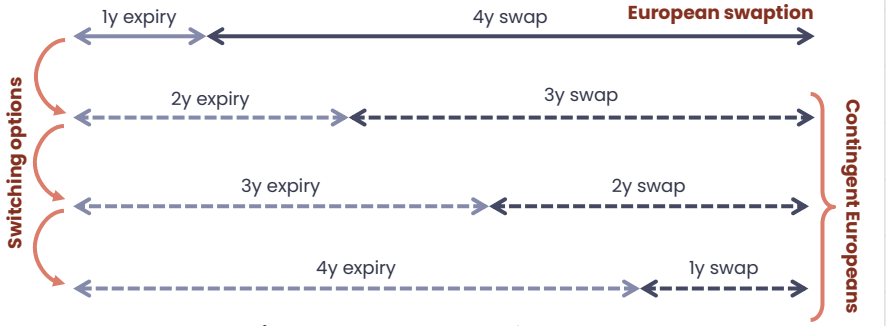

As the **exercise gets longer**, the underlying **swap gets shorter**

European-style

With an expiry **equal to** the **nearest expiry** date, and a set of **switching options** to switch the expiry date to a **later one**

1-year 4-year swaption

With the option to switch to:

2-year 3-year swaption

3-year 2-year swaption

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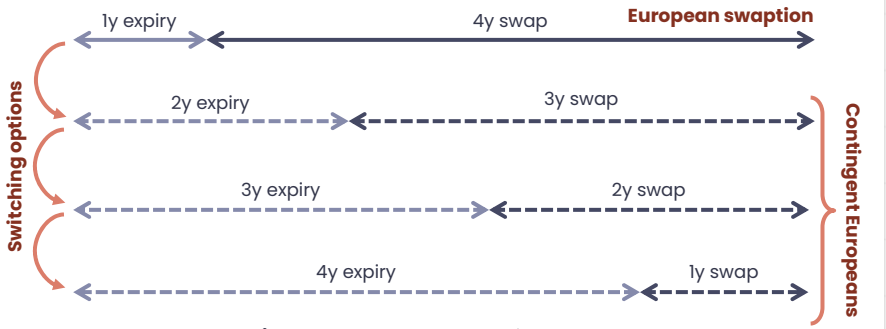

As the **exercise gets longer**, the underlying **swap gets shorter**

Bermudans are usually **priced higher** than the **most valuable European** swaption

The possibility of **switching options** have **positive value**

If the switching options are worthless, then the **Bermudan price = most valuable European swaption**

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Bermudan Valuation

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Bermudan valuation

Valuing Bermudans is complex and can only be done using **numerical approaches** such as:

Binomial trees

Monte Carlo models

However

We can use our **switching options approach** to understand that the **value of a Bermudan:**

Bermudan ≥ Max European

Bermudan = max European + value (switching options)

The **most valuable** underlying **European swaption**

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