Fair Value of Equity Forwards

FINANCIALEDGE

The fair value of equity **forwards** or **futures**

Fair forward value = Spot price + Financing cost − Dividends expected

$$FV_{equity\ fwd} = spot\ price * \left(1 + i * \frac{days}{basis}\right) - dividends$$

- i = Interest rate
- Days = Number of days until **end** of the **forward period**
- Basis = Assumed number of **days in a year**

✓ Forward periods up to **1 year**

FINANCIALEDGE

The fair value of equity **forwards** or **futures**

Dividend yield

$$FV_{equity\ fwd} = spot\ price * (1 + i - dividend\ yield)$$

Dividend yield is the expected **annual dividend** expressed as a **percentage** of the **current stock price** (or similar)

FINANCIALEDGE

$$FV_{equity\ fwd} = spot\ price * \left(1 + i * \frac{days}{basis}\right) - dividends$$

Challenge

Forecasting what the **dividend payments** will be over the **forward period**

Dividends with **ex-div dates** between the **transaction** and **forward dates** are relevant

The **future value** of all **included dividends** at the **forward date** should be used

FINANCIALEDGE

Dividends are declared at the **discretion** of a **company's board**

Confirmed shortly **before they are actually paid**

Companies with historically **consistent dividends**

- Increase
- Decrease
- Suspend their dividends in the future

This unpredictability complicates forecasts, especially for **longer-term contracts**

FINANCIALEDGE

$$FV_{equity\ fwd} = spot\ price * \left(1 + i * \frac{days}{basis}\right) - dividends$$

If the **interest rate is higher** than the **dividend yield**

The **forward trades** at a **premium to spot**

If **interest rates are lower** than the **dividend yield**

The **forward trades** at a **discount to spot**

When **interest rates** and **dividend yields match**

The **spot and forward prices** are **identical**

Forward price does **not predict future price movements**

Financing costs

Asset yields

FINANCIALEDGE

$$FV_{equity\ fwd} = spot\ price * \left(1 + i * \frac{days}{basis}\right) - dividends$$

No-arbitrage assumption based on frictionless markets

Market reality

Actual price differs theoretical fair value

Transactions costs

Differences between borrowing and lending rates

Other frictions

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Market participants calculate the fair value

If real market price is **too low:**

Buy the forward and sell the spot asset

If real market price **too high:**

Sell the forward and buy the spot asset

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Fair Value of Equity Forwards Example

FINANCIALEDGE

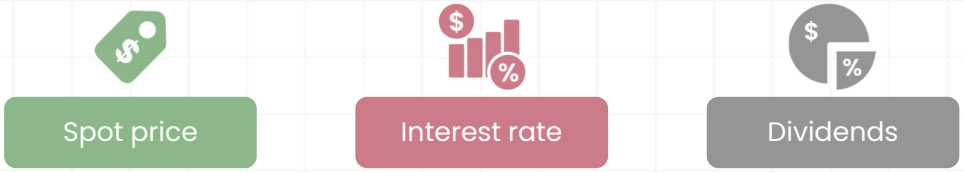
Spot price of the asset:	100
12-month interest rate:	5%
12-month future value of dividends:	6

$$FV_{equity\ fwd} = spot\ price * \left(1 + i * \frac{days}{basis}\right) - dividends$$

12-month fair forward price:	100 + 5 – 6	99

FINANCIALEDGE

Spot price of the asset:	100
12-month interest rate:	5%
12-month future value of dividends:	6
12-month fair forward price:	100 + 5 – 6	99



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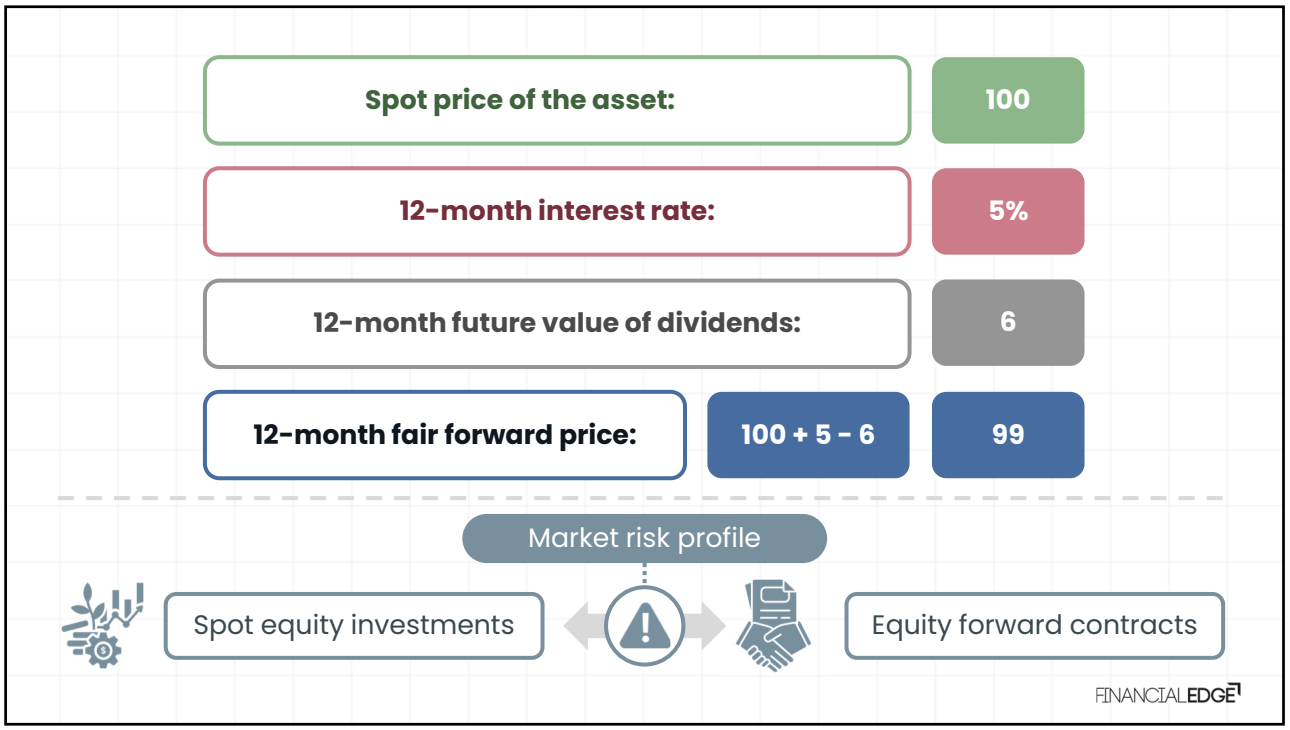
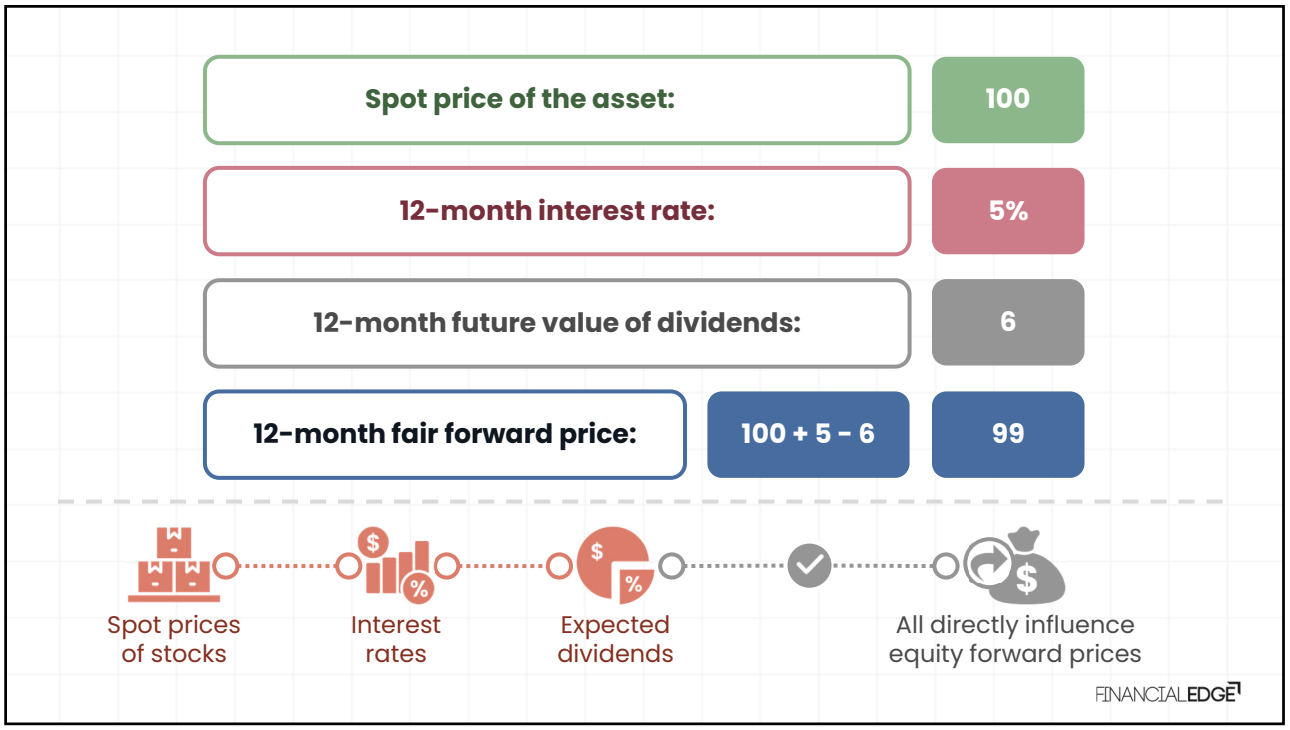




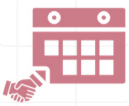
Equity Forward Sensitivities

FINANCIALEDGE

Market risk

Moving from the **direct cash purchase of a security**

Forward contract



Settlement date

Profile of risk exposure

Price

FINANCIALEDGE

HD0

The fair forward price of a **12-month forward contract** under different scenarios

- **Initial position**
- **Spot price increased**
- **Interest increased**
- **Dividend increased**
- **3 months have passed**

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Initial position

Spot price	100
	+
12 - month interest rate (5%)	5
	-
12 - month dividend	6
	=
Fair forward price	99

FINANCIALEDGE

HD0 Andrew -
For this next series of slides, could the initial position always be shown on the left side as the other 4 options are used in comparison to the initial position, so I'd like that to always be on screeen
Henry Davies, 2024-03-20T14:46:18.679

Initial position	
Spot price	100
+	
12 - month interest rate (5%)	5
-	
12 - month dividend	6
=	
Fair forward price	99

Spot price increase	
Spot price	101
+	
12 - month interest rate (5%)	5.05
-	
12 - month dividend	6
=	
Fair forward price	100.05

Increase in the **spot price** will typically result in an **elevated forward price**

FINANCIALEDGE

Initial position	
Spot price	100
+	
12 - month interest rate (5%)	5
-	
12 - month dividend	6
=	
Fair forward price	99

Interest increase	
Spot price	100
+	
12 - month interest rate (6%)	6
-	
12 - month dividend	6
=	
Fair forward price	100

With an increase in **interest rates**, the **fair forward** price will also **increase**

FINANCIALEDGE

Initial position	
Spot price	100
+	
12 - month interest rate (5%)	5
-	
12 - month dividend	6
=	
Fair forward price	99

Expected dividend increase	
Spot price	100
+	
12 - month interest rate (5%)	5
-	
12 - month dividend	7
=	
Fair forward price	98

Higher expected dividends lead to **lower forward price**

FINANCIALEDGE

Initial position	
Spot price	100
+	
12 - month interest rate (5%)	5
-	
12 - month dividend	6
=	
Fair forward price	99

3 months pass	
Spot price	100
+	
12 - month interest rate (5%)	3.75
-	
12 - month dividend	4.5
=	
Fair forward price	99.25

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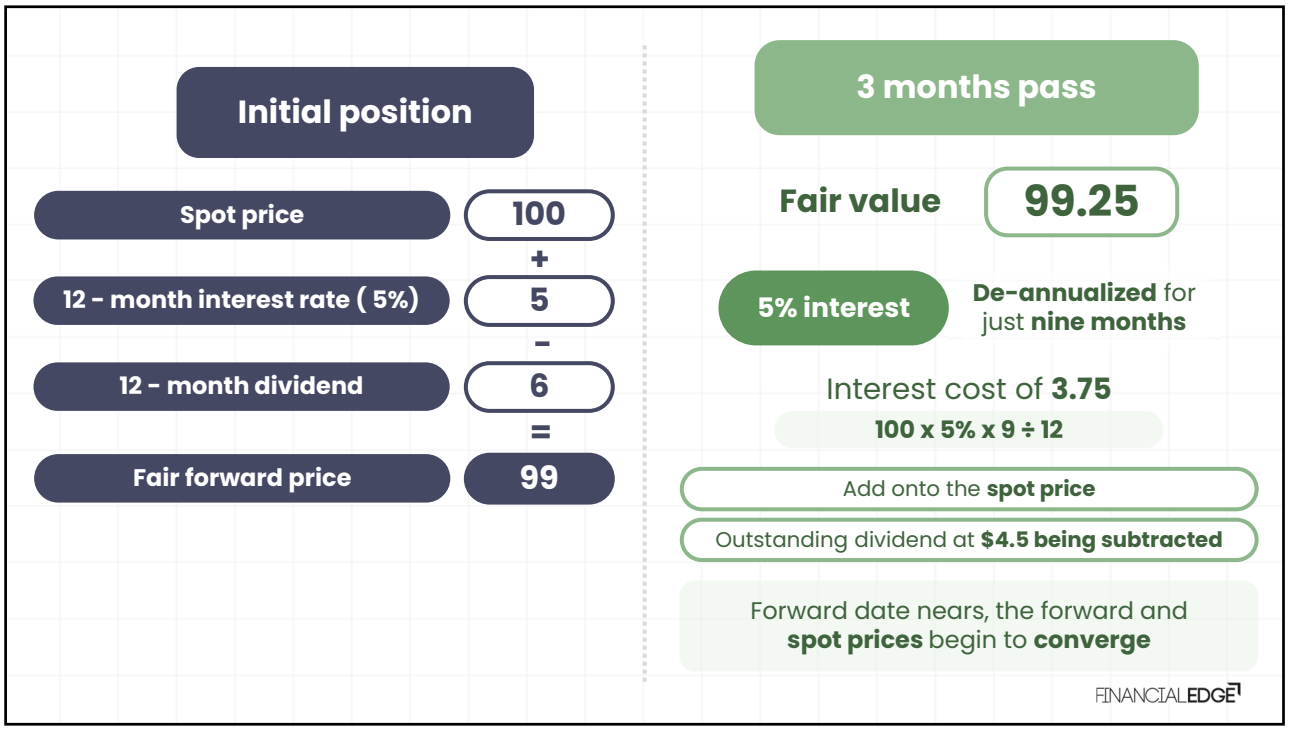

Forward vs. Futures

FINANCIALEDGE

Forwards

Futures

FINANCIALEDGE

Forwards

Over-the-counter (OTC) contracts

Out of public eye

Terms negotiated in **private**

No standard template

Shaped to fit the **exact specifications** required

Complexity

Customization adds a **layer of complexity** to the valuation

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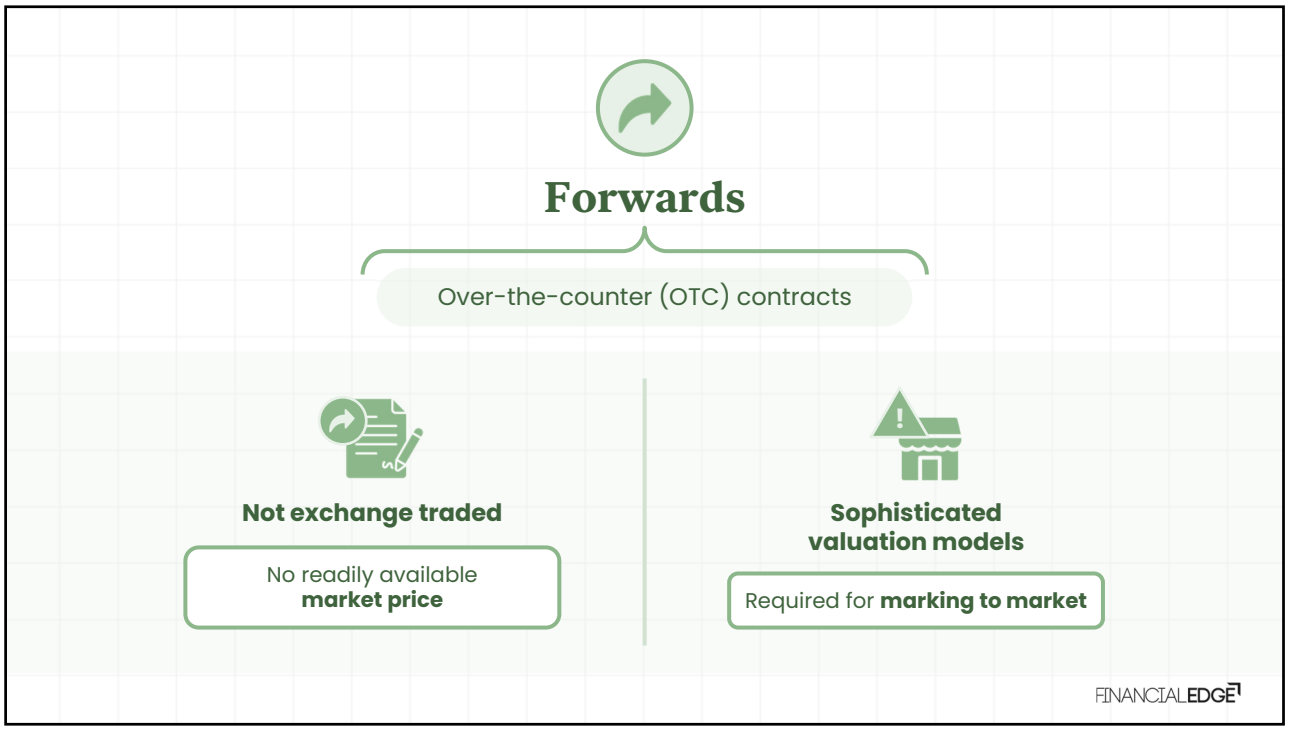
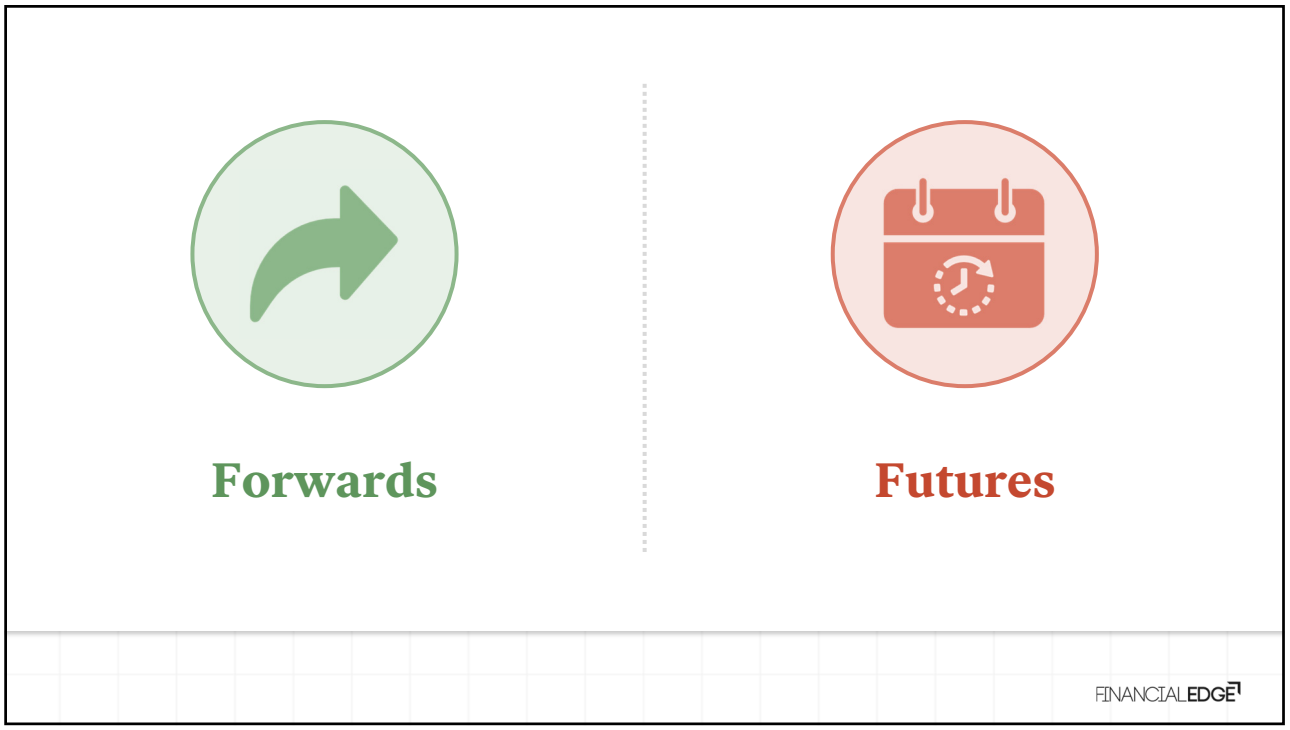
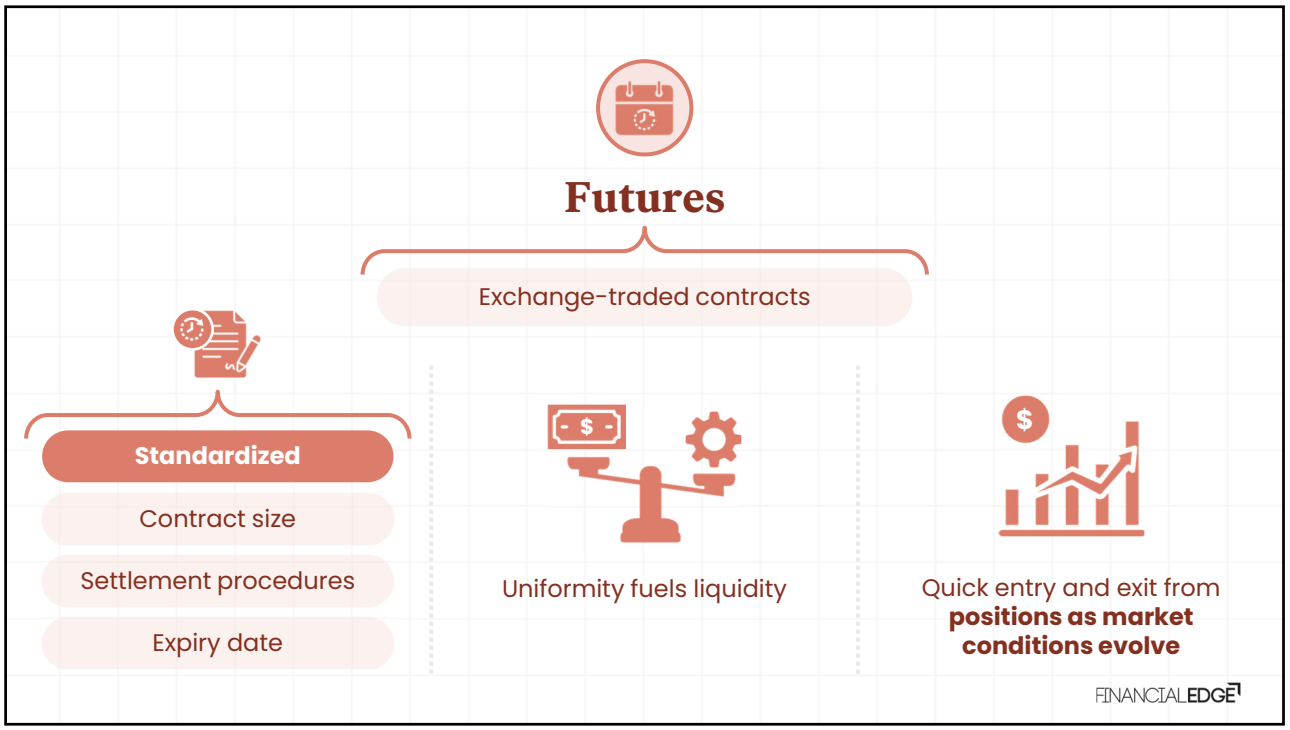
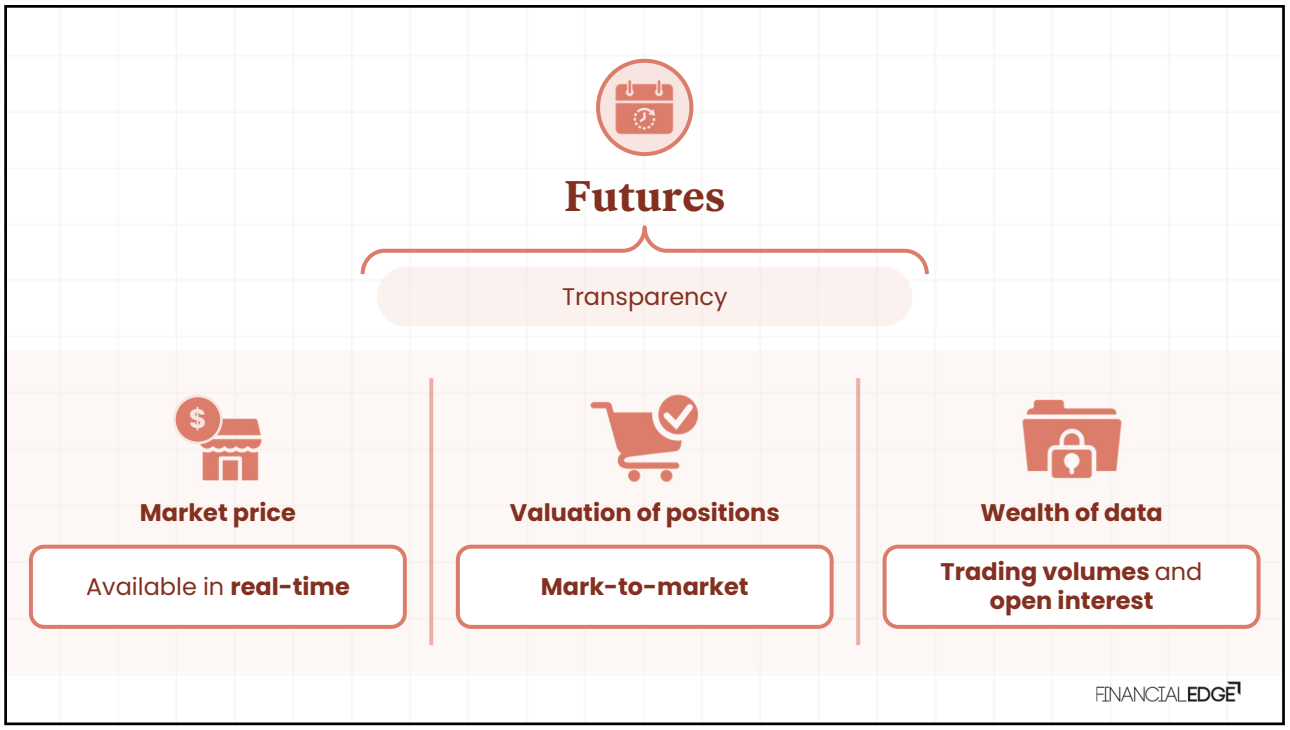








Volume vs Open Interest

FINANCIALEDGE

Volume

Open Interest (OI)

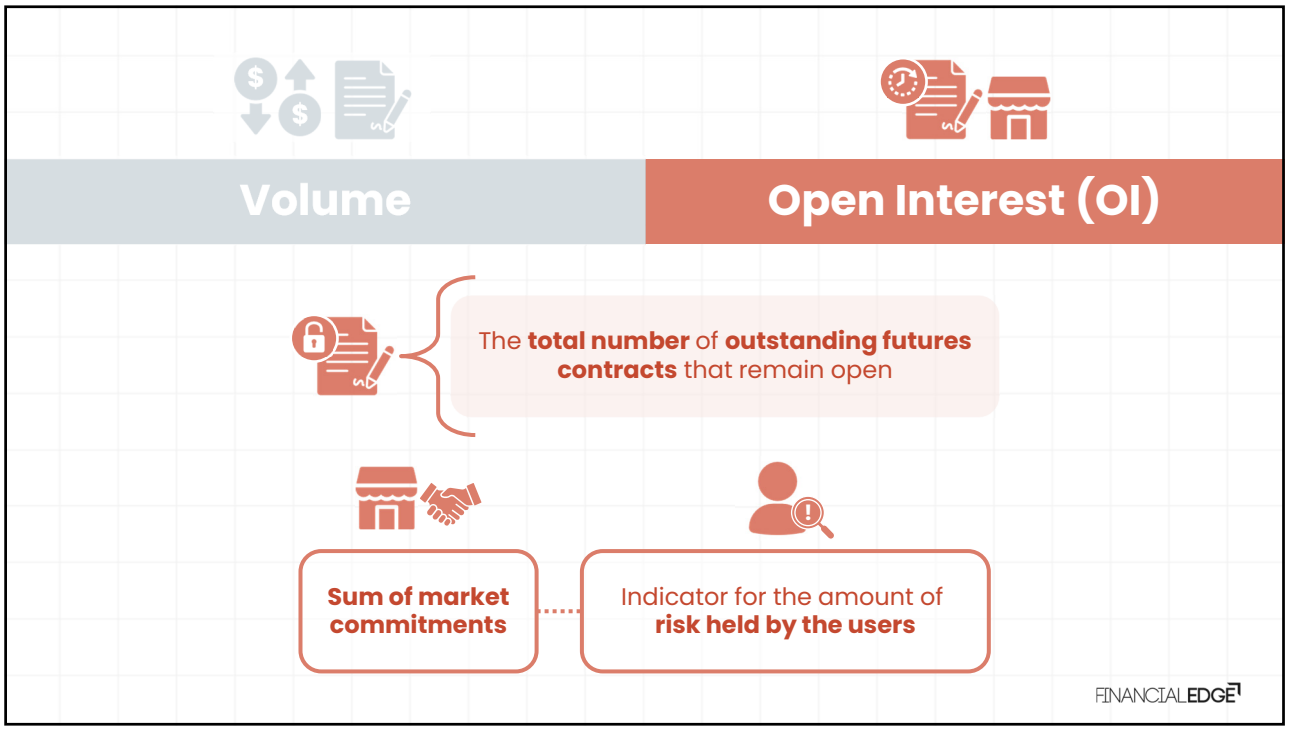
Measures the **trading activity** for a **specific futures contract** during a single trading session

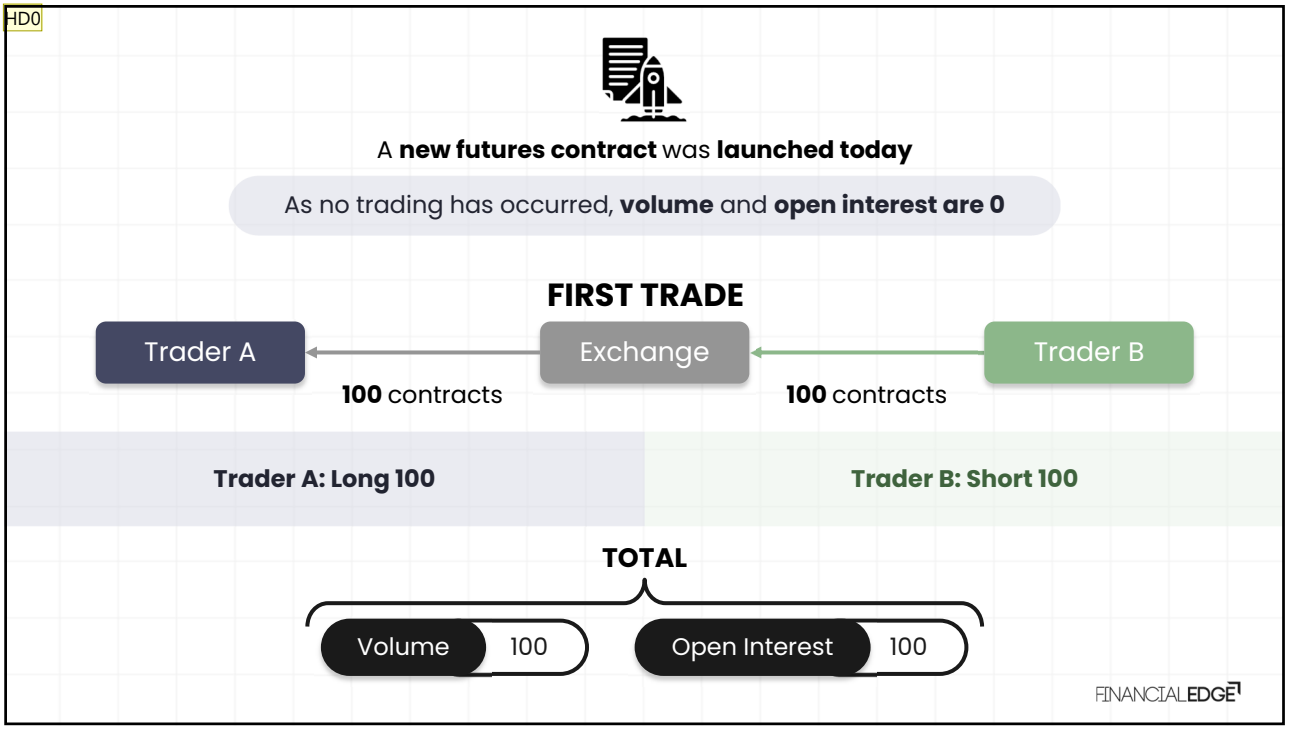
Starts at **zero** when the **market opens**

Resets back to zero after the **market closes**

Volume represents the **number of contracts** that have been **bought** and **sold**

FINANCIALEDGE

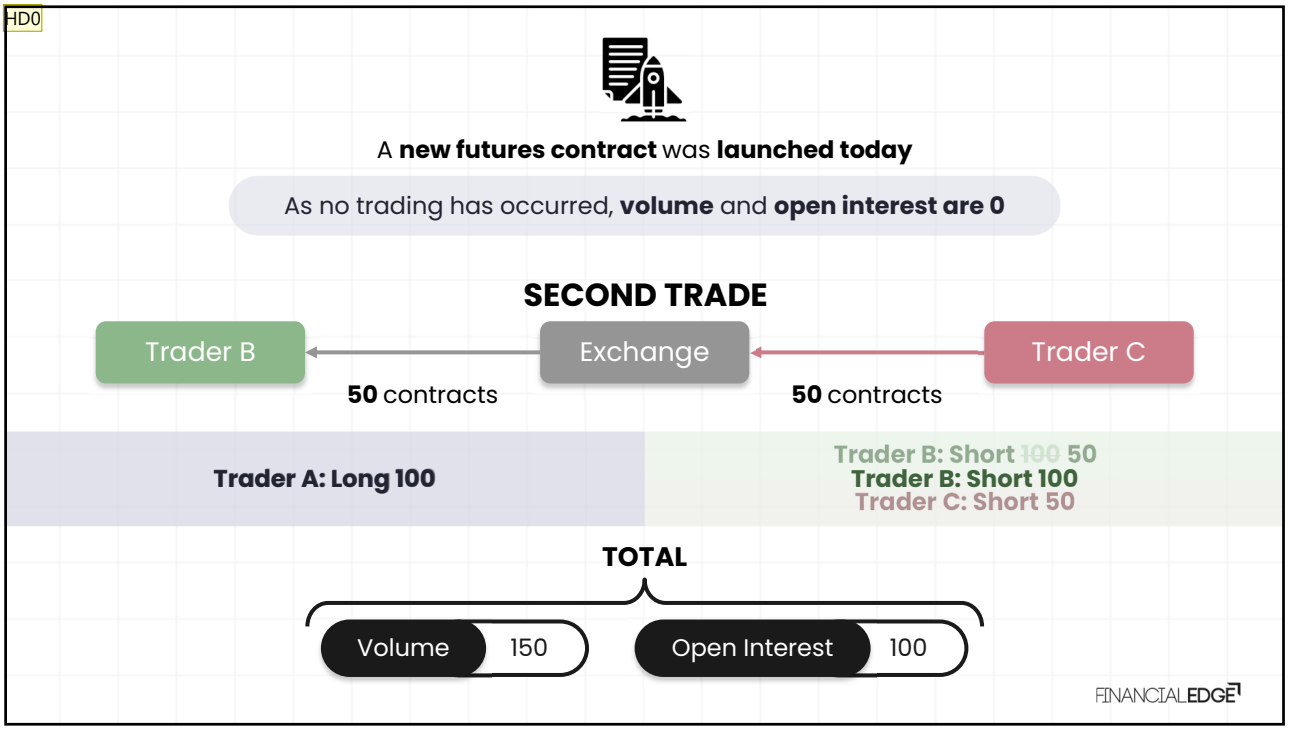


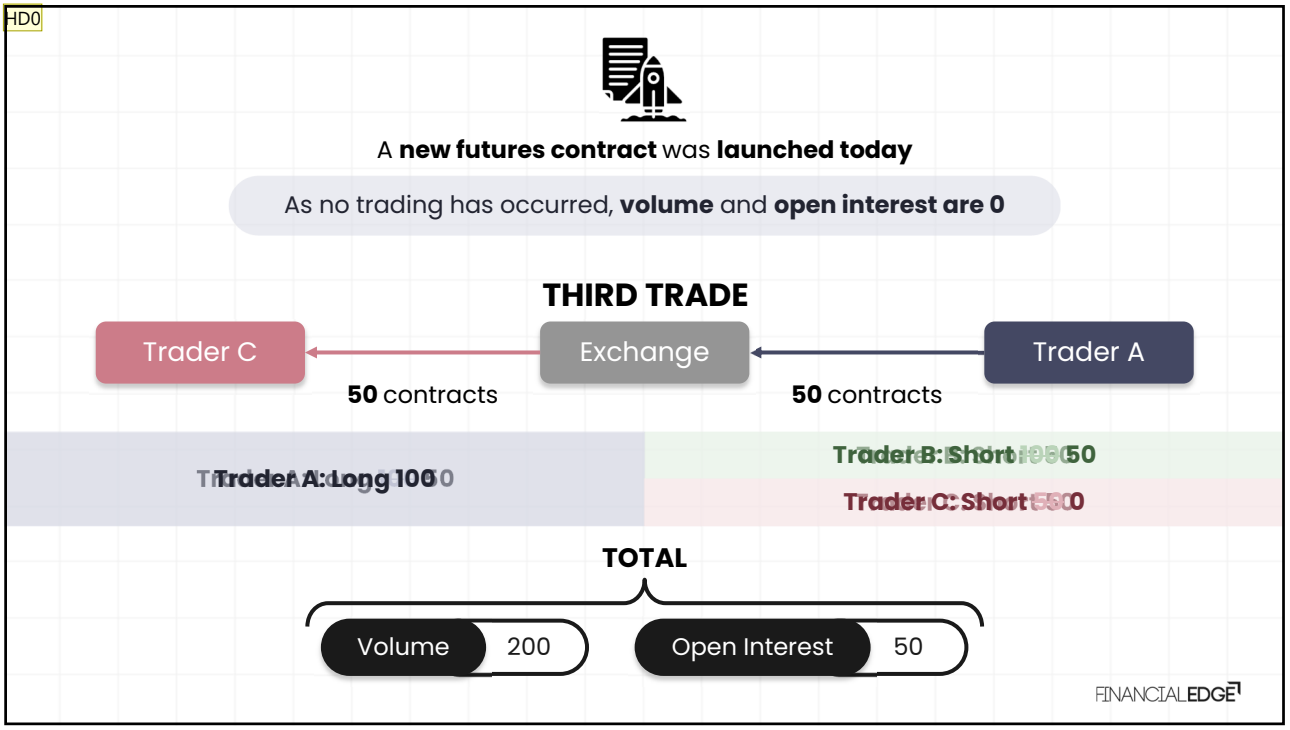


HD0 Andrew - I think this slide needs to run over 3 slides with the trade appearing in the location of trade 1 on this slide each time. The reason is I'd also like a section at the bottom which Shows 2 columns, on the first slide it'll have "Trader A: Long 100" on left and "Trader B Short 100" on right.
Henry Davies, 2024-03-19T15:56:59.513

HD0 0 Andrew - For trade 2, the bottom will be "Trader A: Long 100" on left and on right, "Trader B: Short 50 / Trader C: Short 50" [/ indicates new line"
Henry Davies, 2024-03-19T15:57:09.267

HD0 1 Andrew - For trade 3, the bottom then shows on left "Trader A: Long 50" and on right "Trader B: Short 50"
Henry Davies, 2024-03-19T15:57:18.742





Slide 35

HD0 Andrew - I think this slide needs to run over 3 slides with the trade appearing in the location of trade 1 on this slide each time. The reason is I'd also like a section at the bottom which Shows 2 columns, on the first slide it'll have "Trader A: Long 100" on left and "Trader B Short 100" on right.
Henry Davies, 2024-03-19T15:56:59.513

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Henry Davies, 2024-03-19T15:57:09.267

HD0 1 Andrew - For trade 3, the bottom then shows on left "Trader A: Long 50" and on right "Trader B: Short 50"
Henry Davies, 2024-03-19T15:57:18.742

Slide 36

HD0 Andrew - I think this slide needs to run over 3 slides with the trade appearing in the location of trade 1 on this slide each time. The reason is I'd also like a section at the bottom which Shows 2 columns, on the first slide it'll have "Trader A: Long 100" on left and "Trader B Short 100" on right.
Henry Davies, 2024-03-19T15:56:59.513

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Henry Davies, 2024-03-19T15:57:09.267

HD0 1 Andrew - For trade 3, the bottom then shows on left "Trader A: Long 50" and on right "Trader B: Short 50"
Henry Davies, 2024-03-19T15:57:18.742

CME E-Mini S&P 500 Futures

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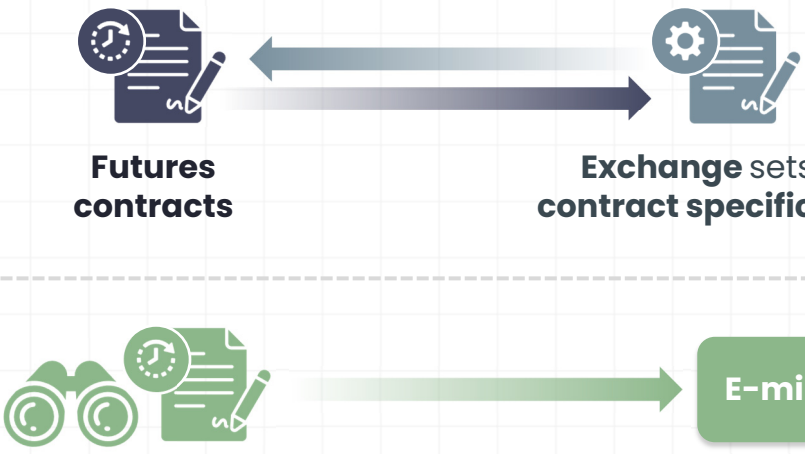

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Contract Specifications

Product code	**ES**
Contract size	**$50 x S&P 500** index
Tick size	**0.25** index points
Tick value	**$12.50**
Expiry	**3rd Friday** of the contract month**, trading terminates 9:30 AM ET that day**
Contract months	**Contracts** listed for **21 consecutive quarters** in the cycle **Mar, Jun, Sep, Dec**
Settlement	**Cash**

Data as of 22/11/2023. Source: CME

FINANCIALEDGE

Contract example

Contract code	**ESZ3**
Expiry	**15 Dec 2023**
Last price	**4565.75**
Contract value	**$228,287.50**
Open interest	**2,195,765 contracts**

Data as of 22/11/2023. Source: CME

	100 ESZ3 contracts
	Each **index point's value** at **$50**
	Quantity of **contracts at 100**
	$50,000

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Hedging with Equity Index Futures

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A significant portion of trading in **equity index futures** comes from **hedging activities**

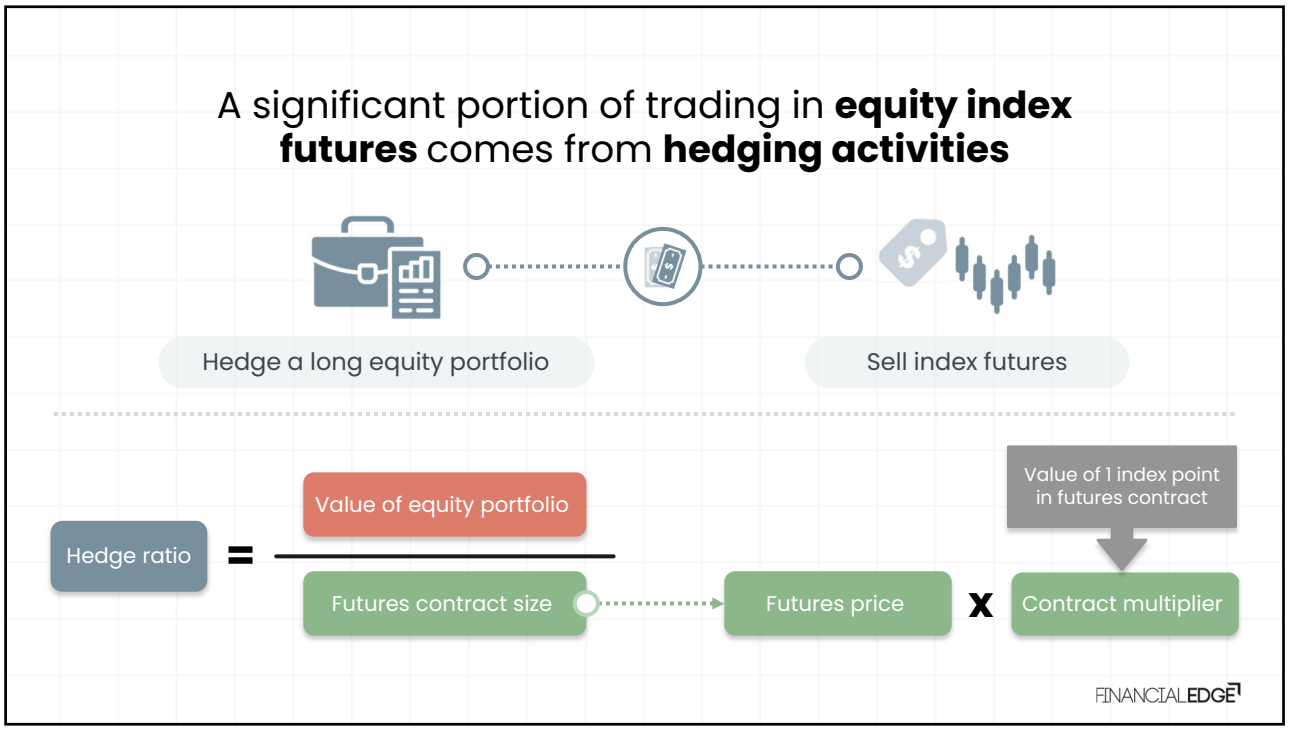
Hedge a long equity portfolio

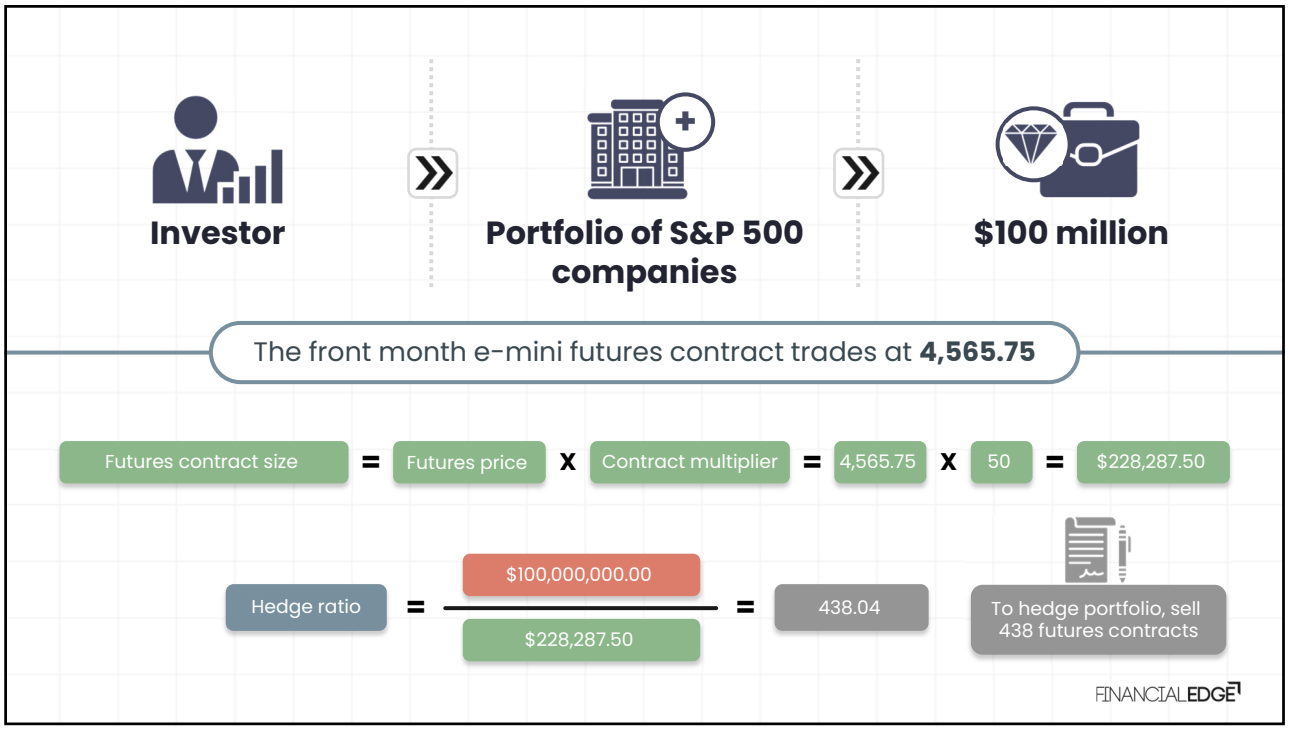
Sell index futures

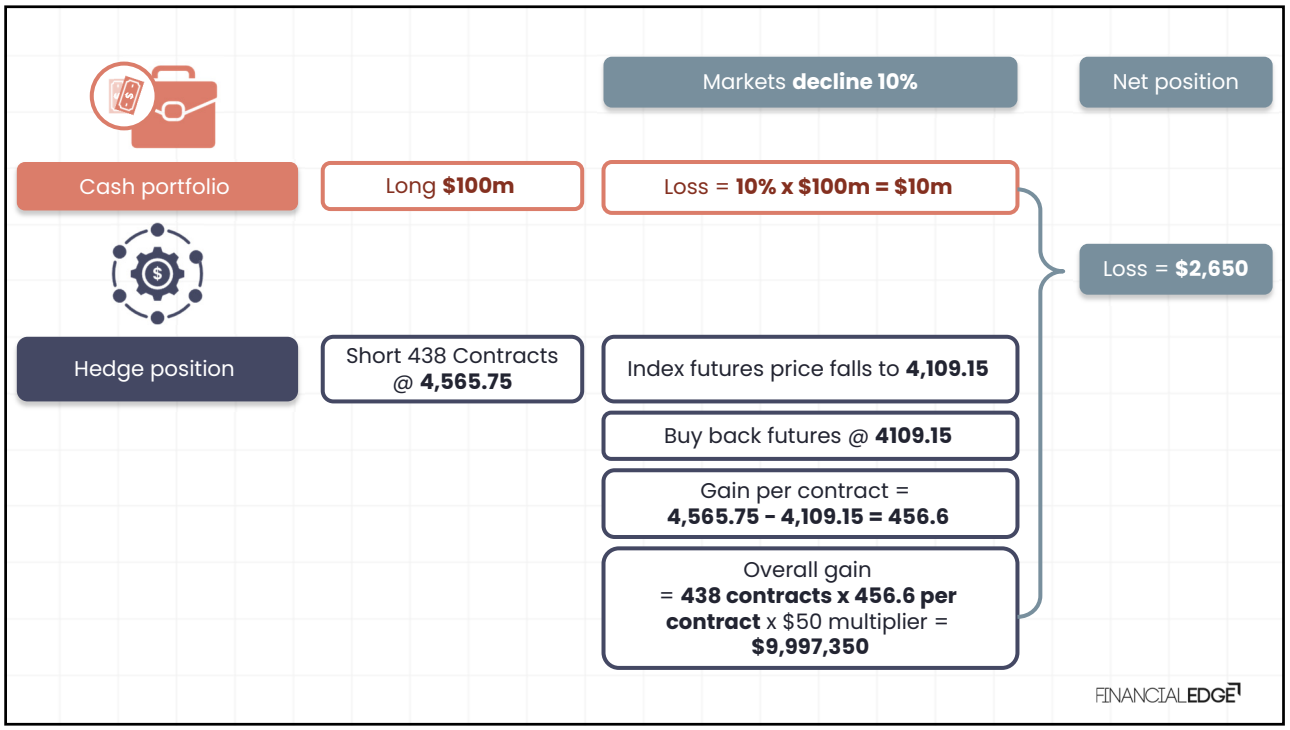
Determines the number of **futures contracts** required for an **effective hedge**

Investors calculate the **hedge ratio**

FINANCIALEDGE







Hedging with Equity Index Futures - Beta Adjusted

FINANCIALEDGE

Basic **Futures Hedge**

Requires **strong negative correlation** between:

Cash equity position

Equity futures position

Portfolio of stocks that moves in **same direction** but **different magnitude**

Basic hedge may **fall short**

FINANCIALEDGE

Index futures fall by **10%**

Portfolio might **decline**

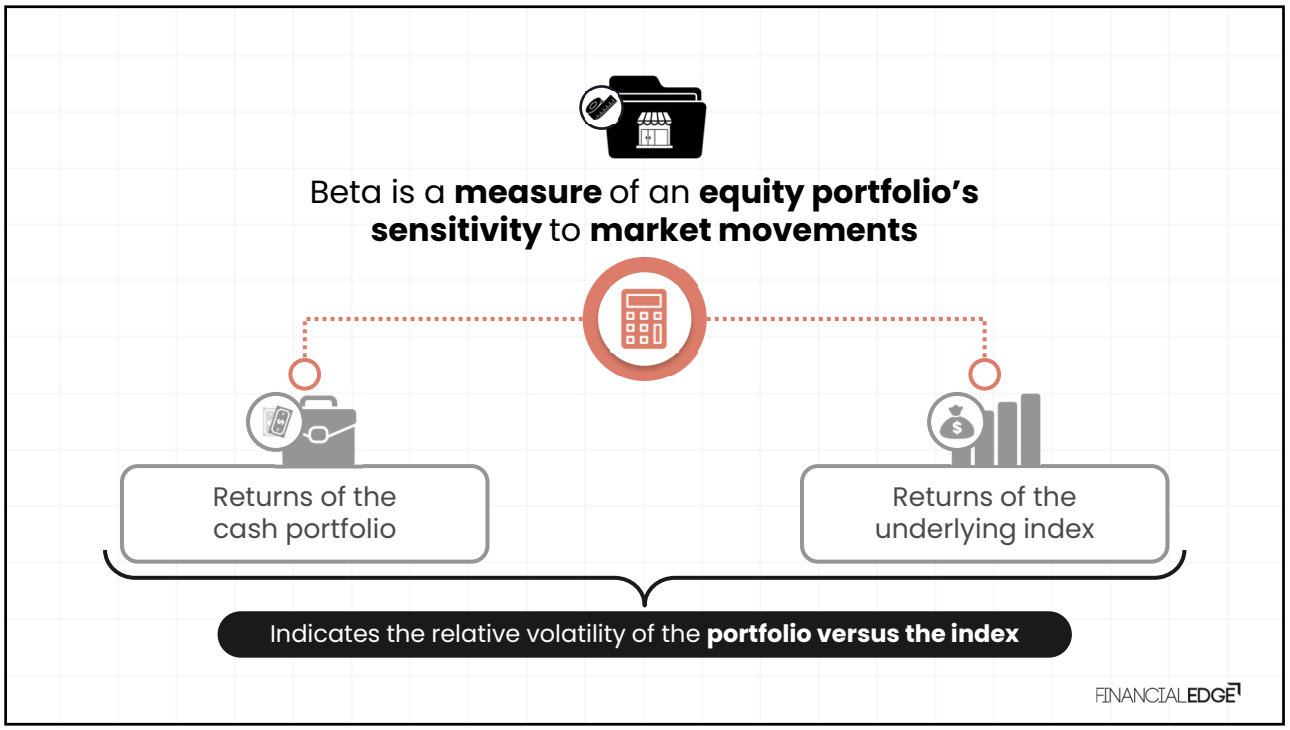
By more than 10%

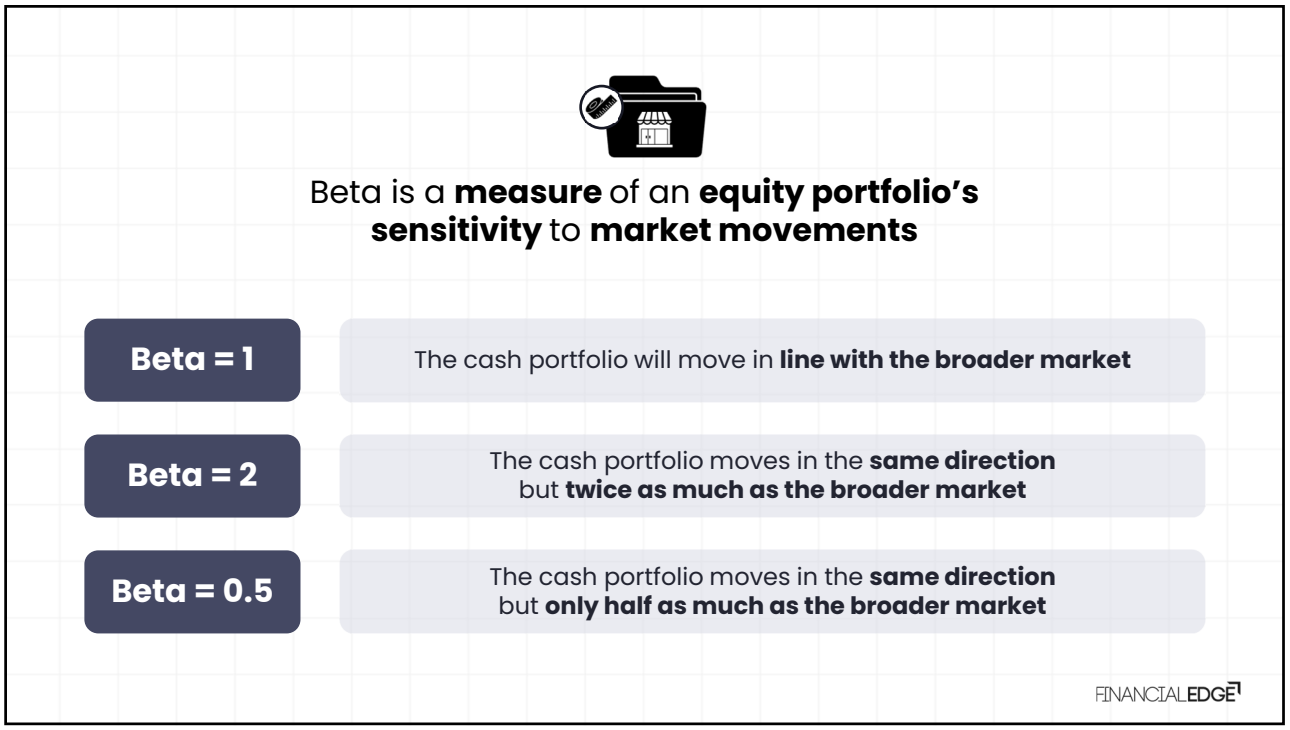
Futures position not fully offsets the **larger losses** in the portfolio

Beta–adjusted hedge

The **individual risk** of the **portfolio relative** to the **index future**

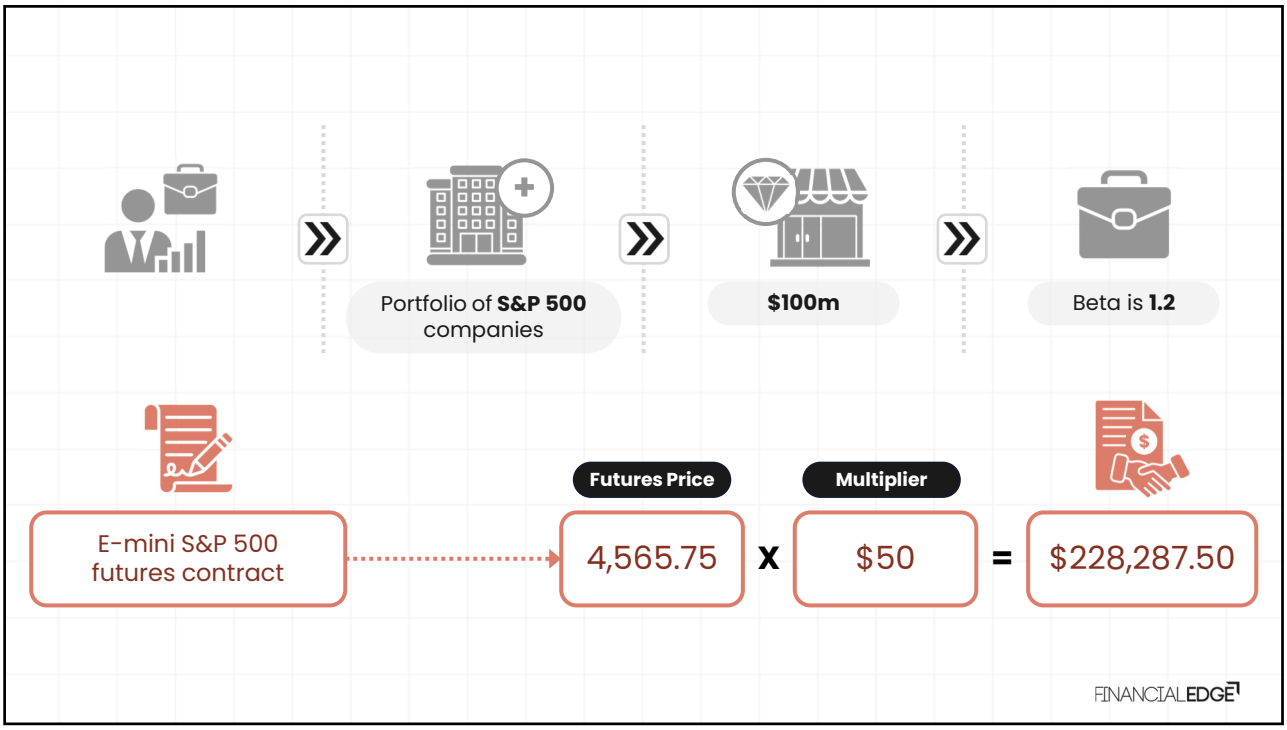
FINANCIALEDGE





Hedging with Equity Index Futures - Beta Adjusted Example

FINANCIALEDGE



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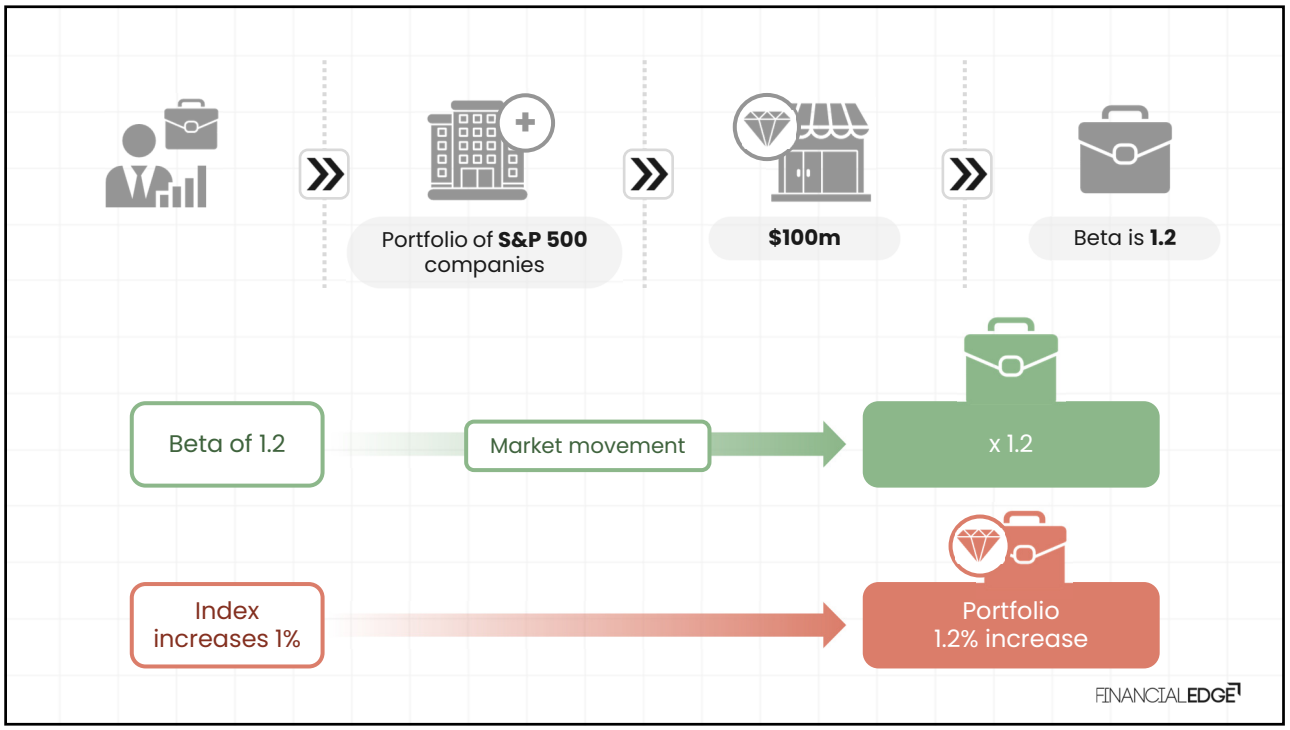
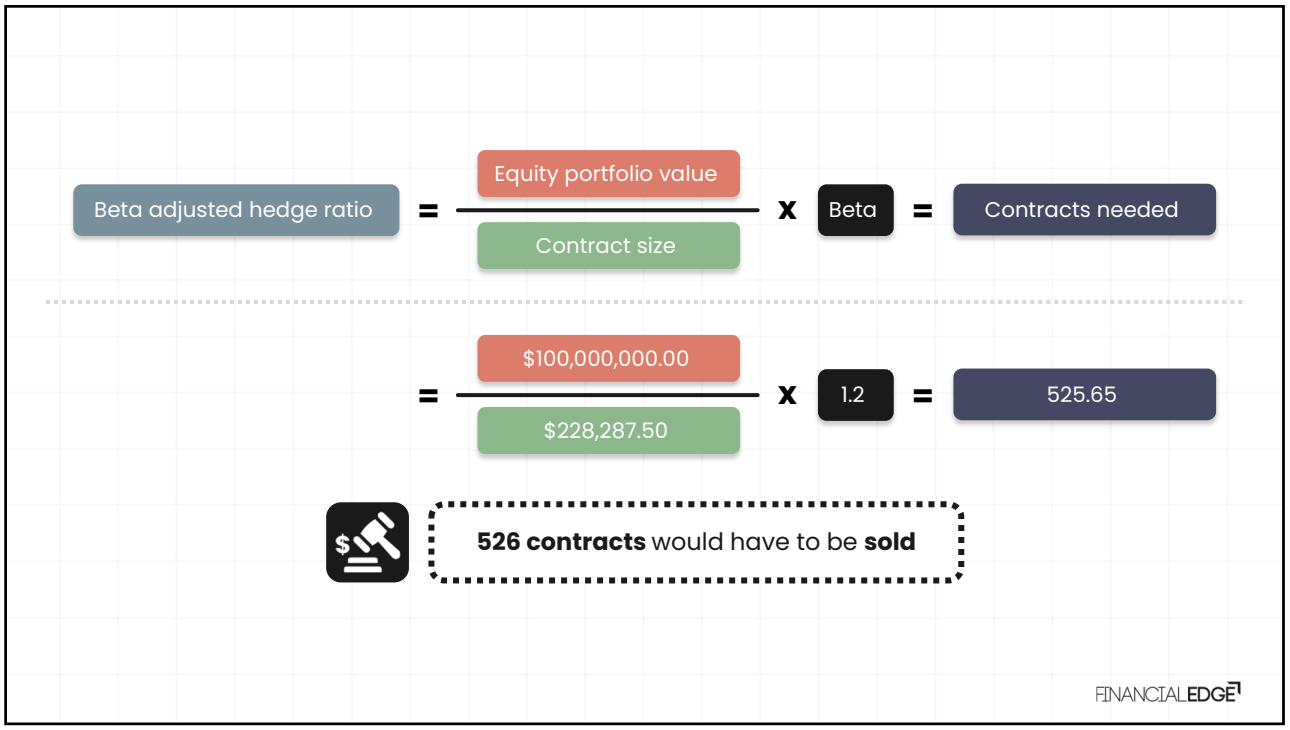
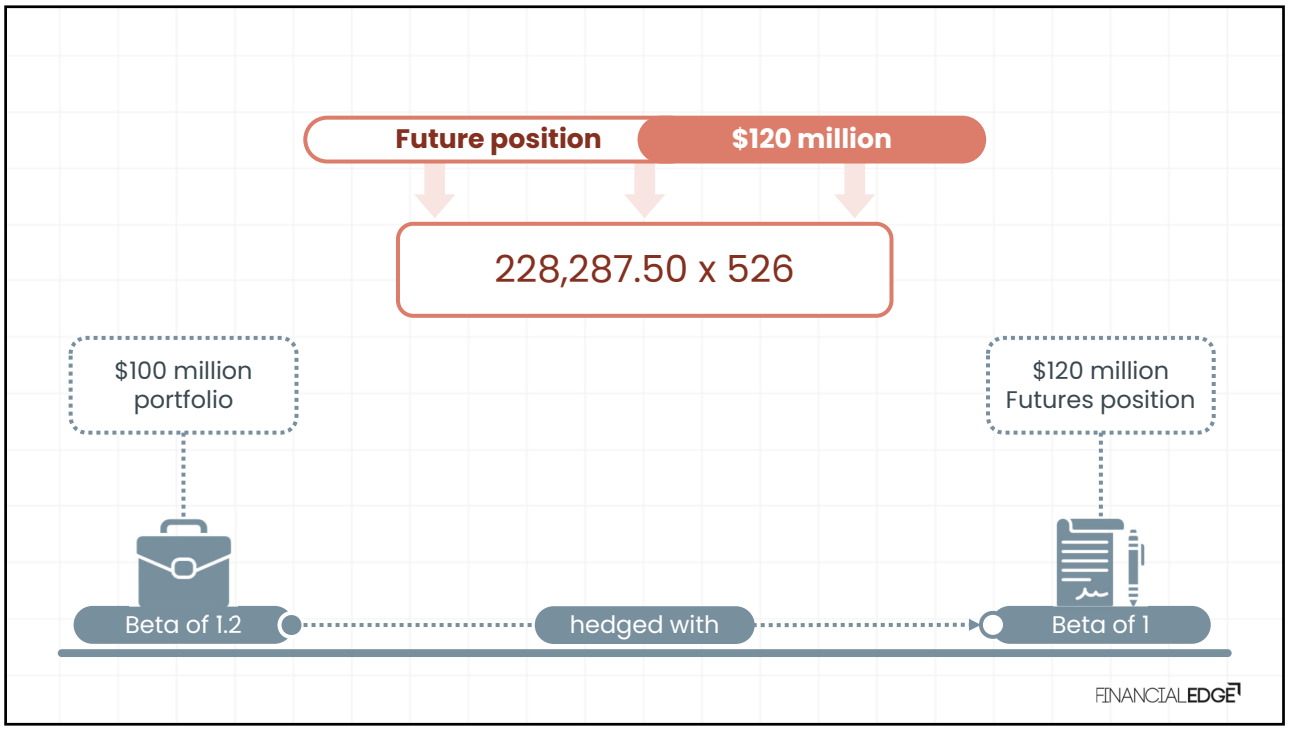
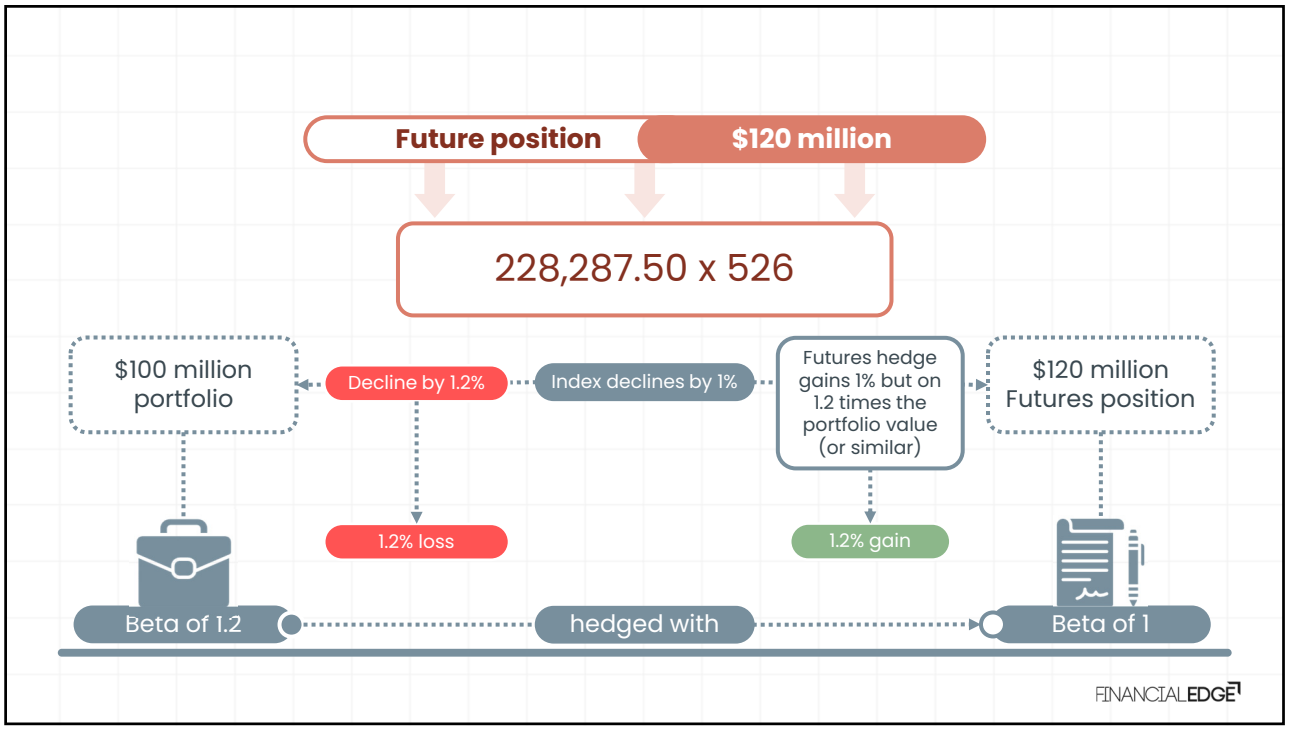
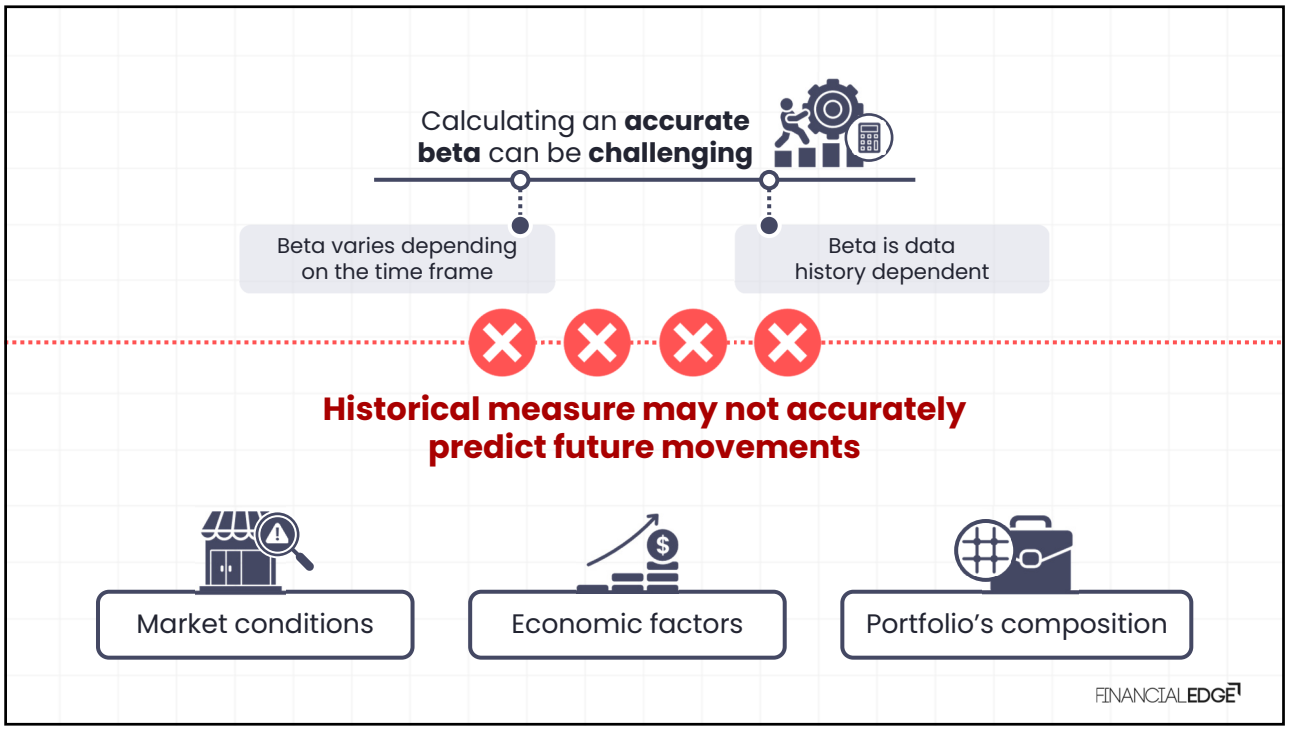
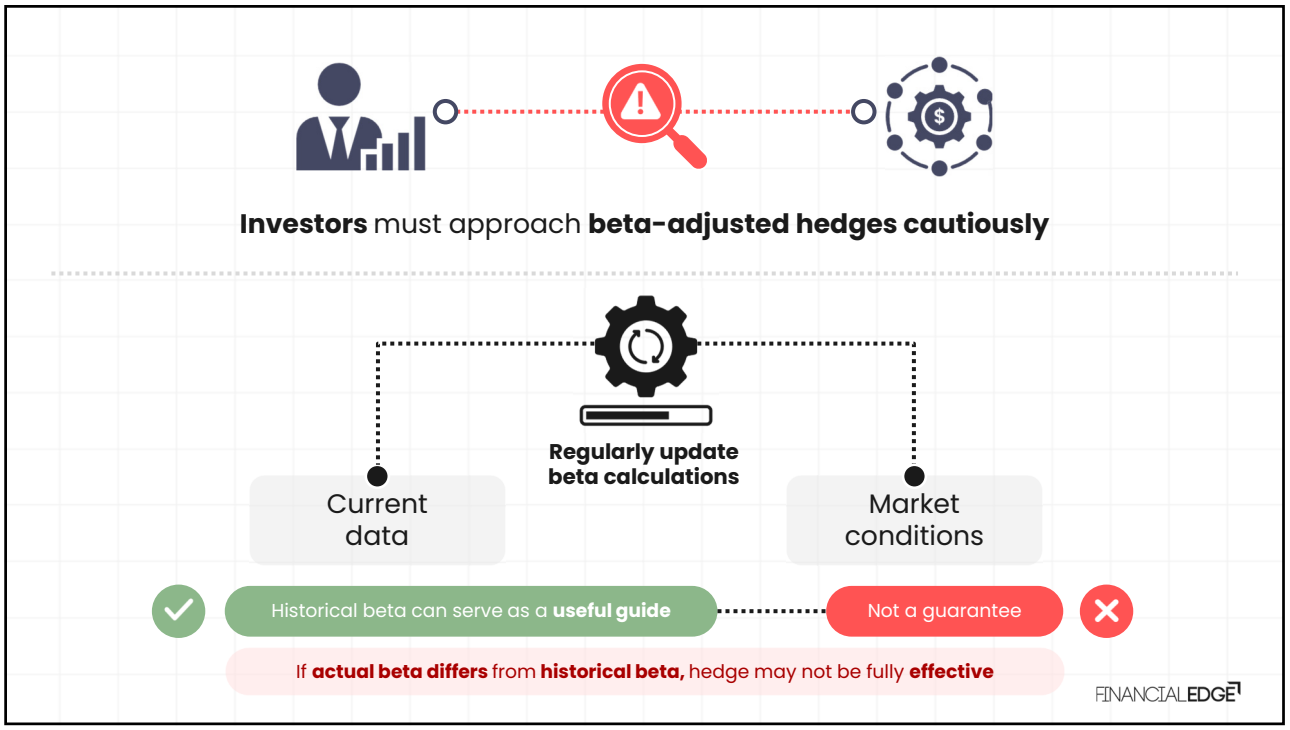

Portfolio of **S&P 500** companies
$100m
Beta is **1.2**
Beta of 1.2
Market movement
x 1.2
Index increases 1%
Portfolio 1.2% increase
FINANCIALEDGE


Beta adjusted hedge ratio
=
Equity portfolio value
Contract size
X
Beta
=
Contracts needed
=
$100,000,000.00
$228,287.50
X
1.2
=
525.65
526 contracts would have to be **sold**
FINANCIALEDGE







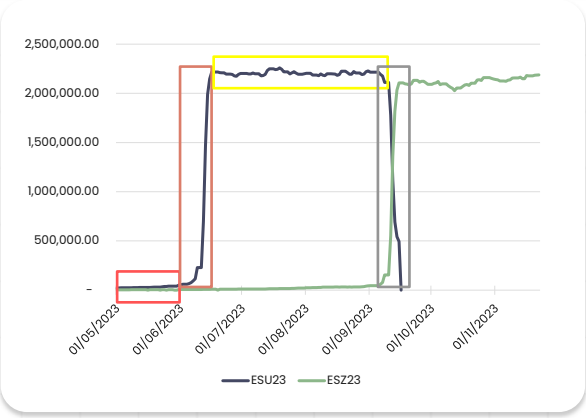


Equity Index Futures - Liquidity

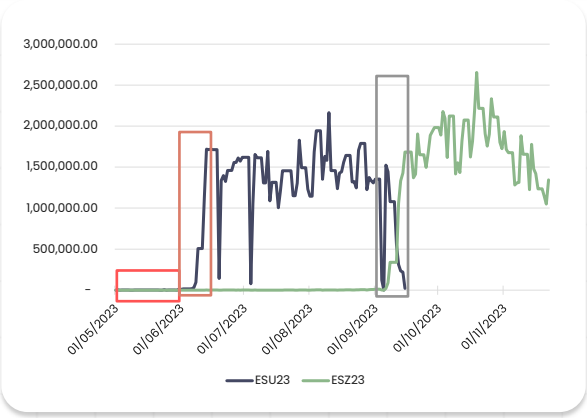
FINANCIALEDGE

Do contracts that expire relatively soon **trade with as much liquidity** as contracts that have an **expiry further into the future?**

Open Interest

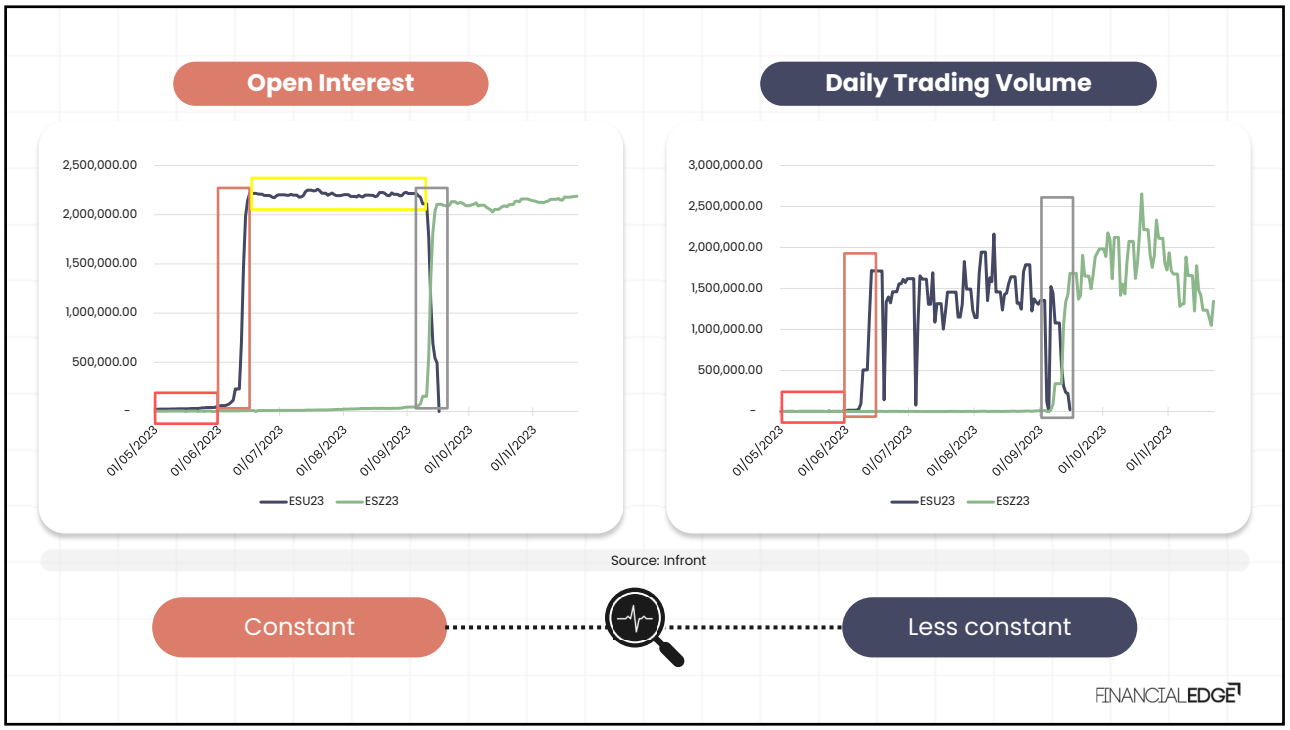


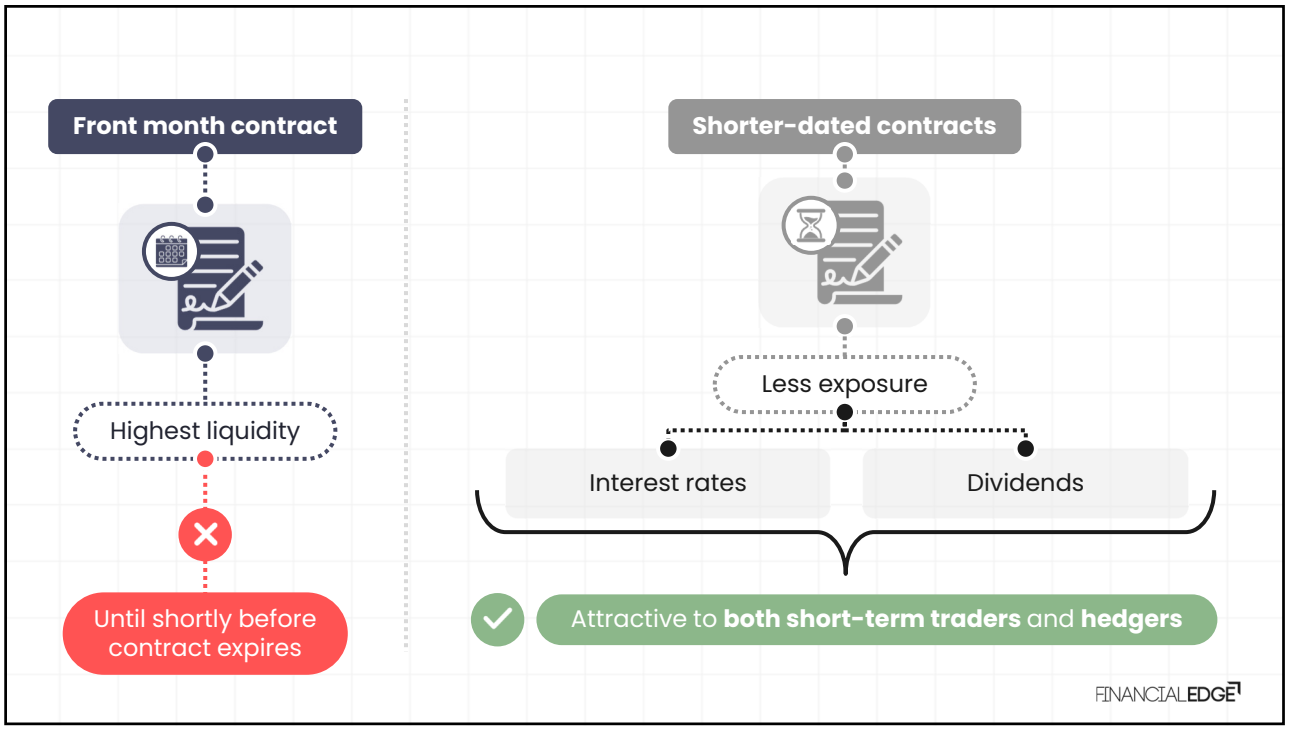
Daily Trading Volume

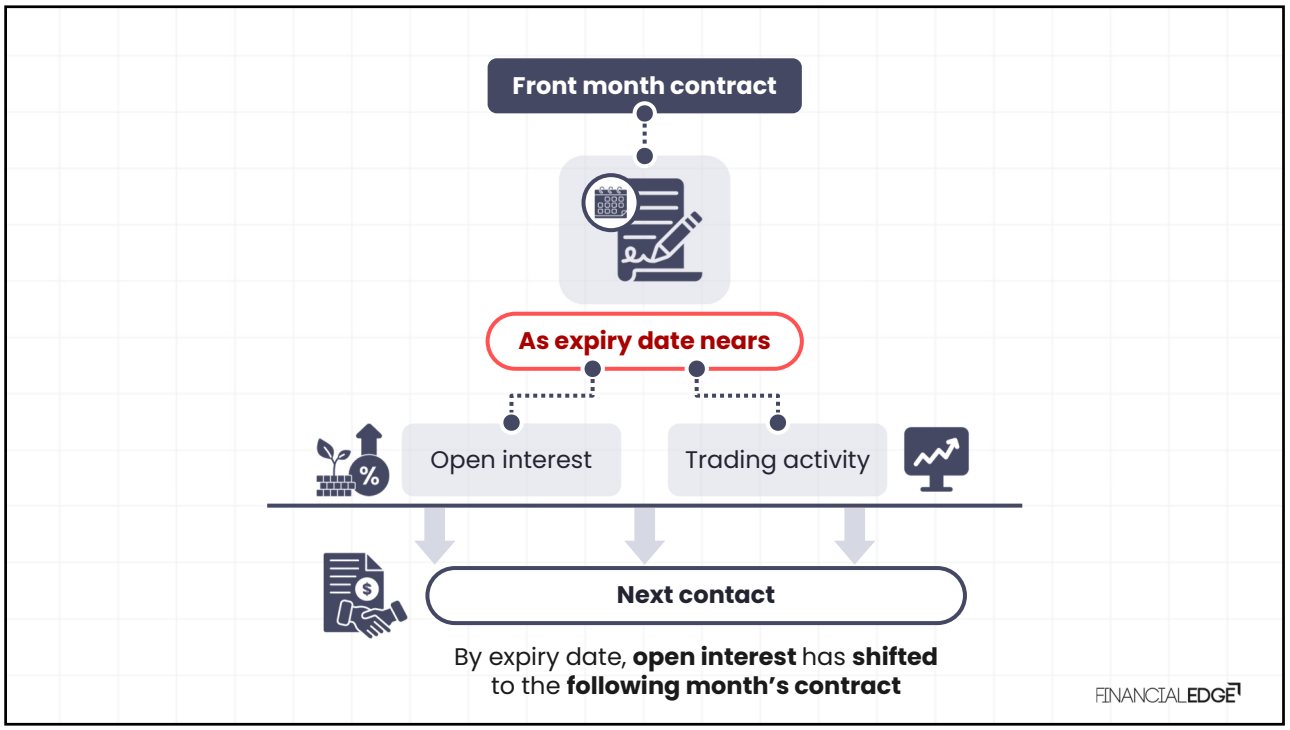


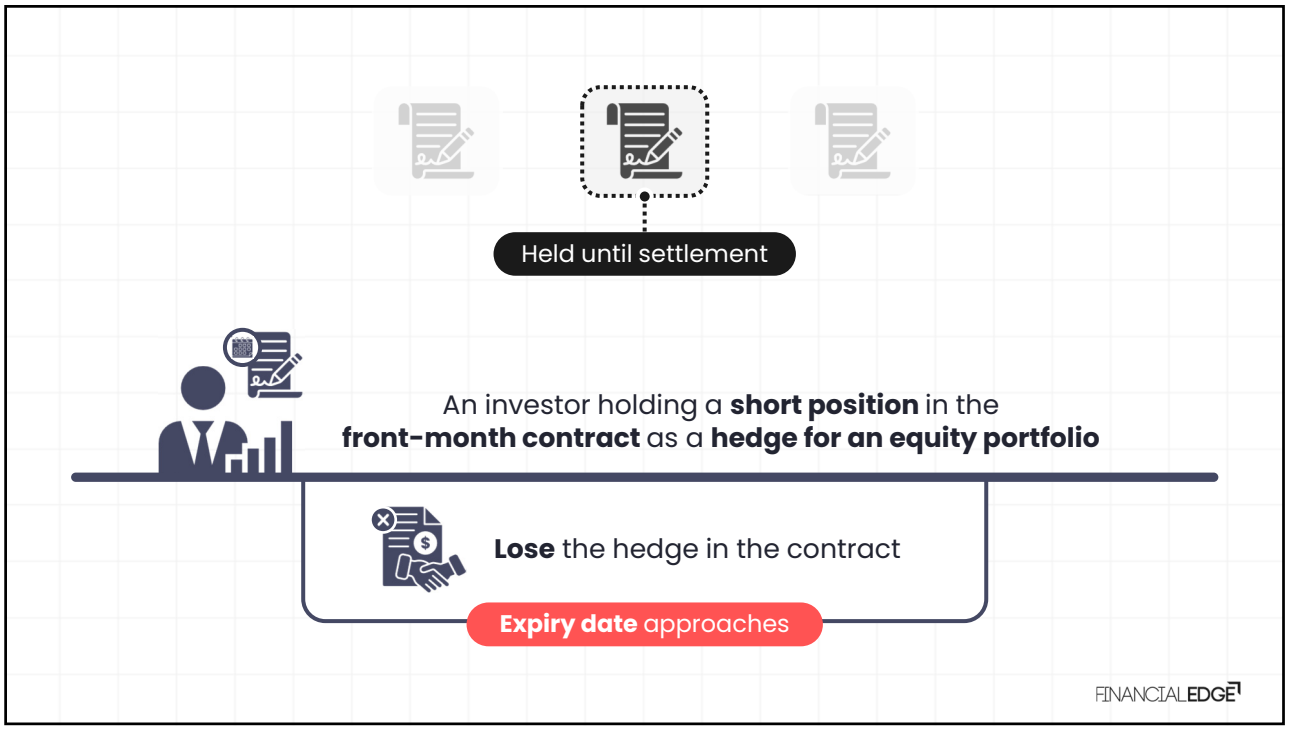
Source: Infront

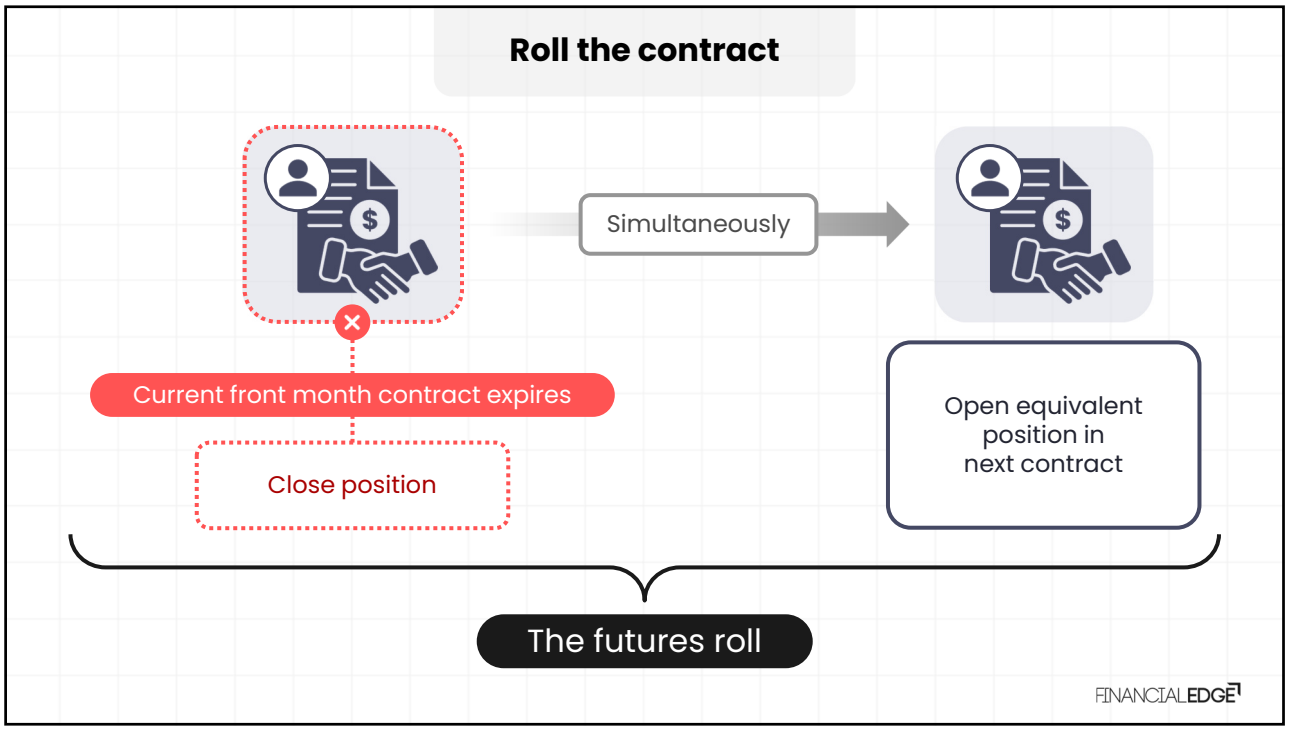
FINANCIALEDGE











Equity Index Futures - Roll

FINANCIALEDGE

Retain exposure beyond expiry?

YES

Close out position in **front month contract** and simultaneously open an **equivalent position in the next contract** ("Futures roll")

NO

Close out the **existing position** or wait **for final settlement**

Roll

Traders maintain their exposure without **interruption** by **shifting it to the next contract**

FINANCIALEDGE

The **"roll"** is often quoted as a **single price**

Price of front month contract

Price of next month contract

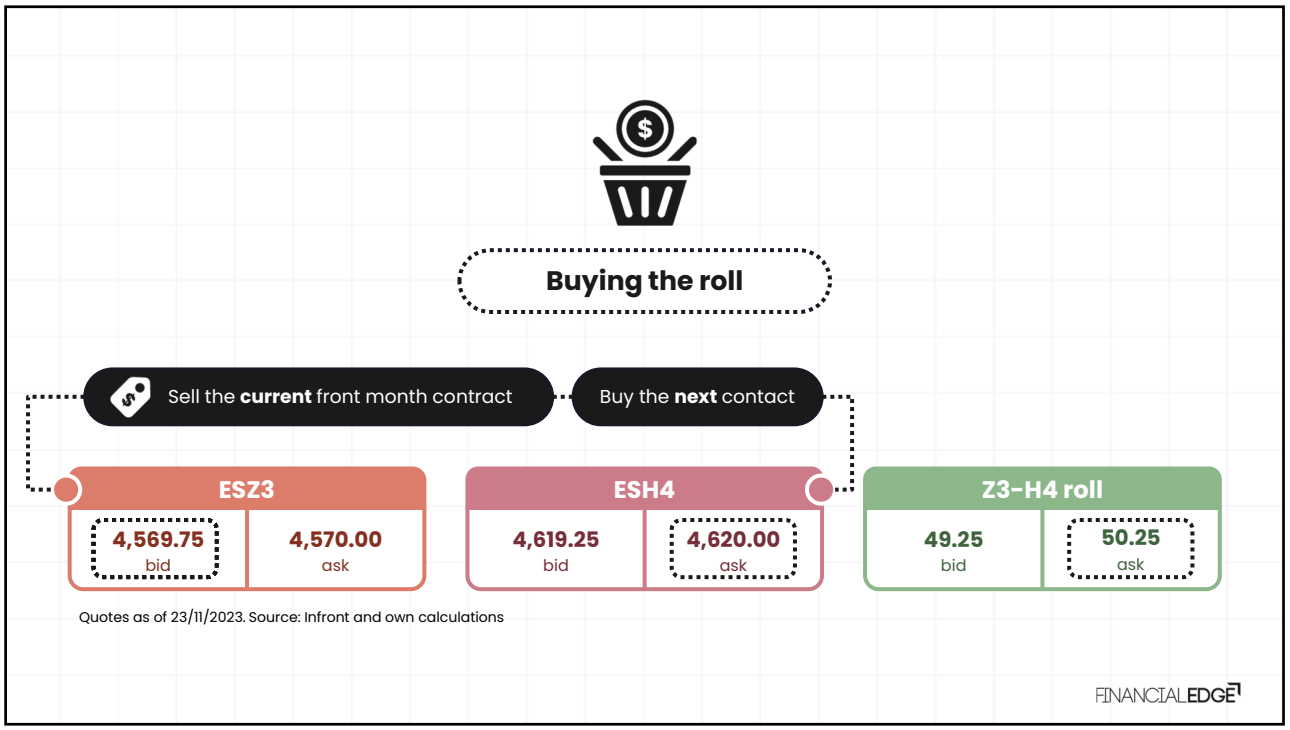
Trading the **roll directly**

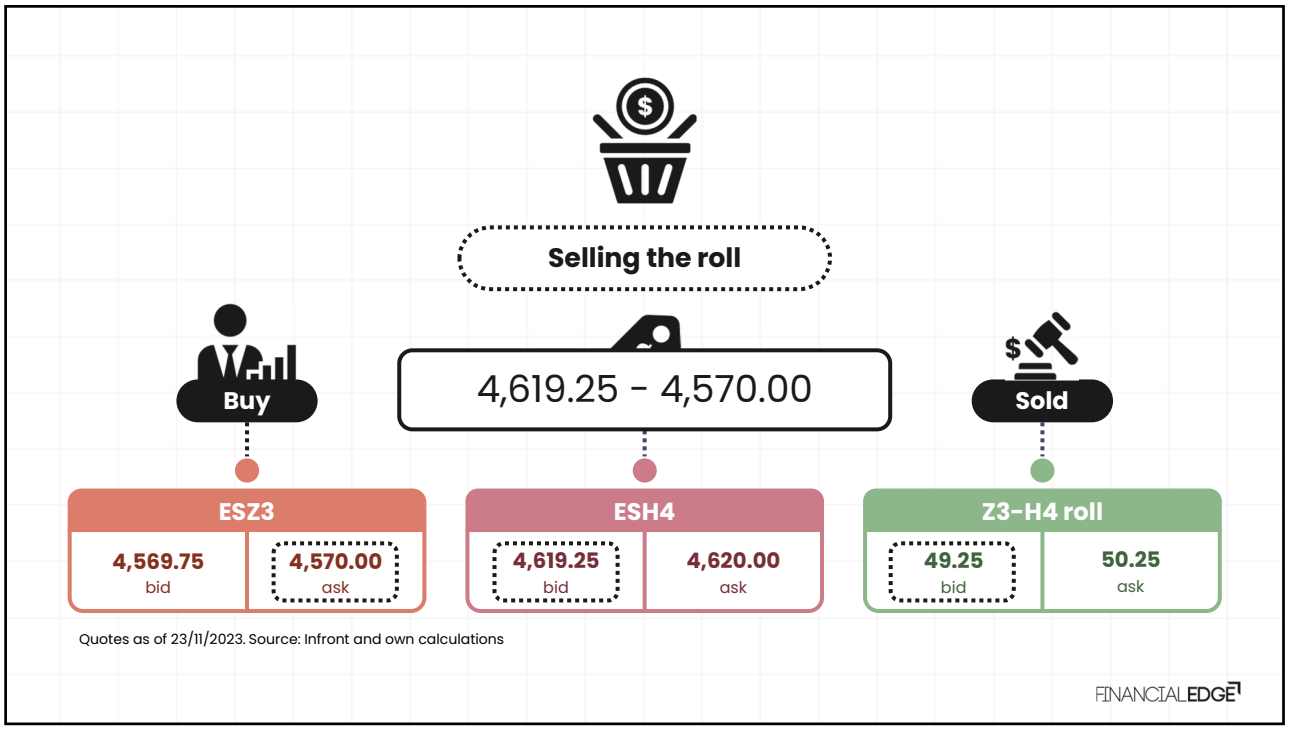
Beneficial

Allows traders to **lock in the spread** between **the two contracts** in a single, streamlined transaction

This **minimizes** the **risk of price fluctuations**

FINANCIALEDGE





Equity Index Futures - Basis

FINANCIALEDGE

The difference between the **futures price** and the **spot price** of the **underlying asset**

Basis	=	Futures price	–	Spot price
11.18		E-mini future 4,570.00		S&P 500 index 4,558.82

FINANCIALEDGE

Positive Basis — The futures price trades at a **premium to spot**

Interest rates > Dividend yield → **Positive** cost of carry

Negative Basis — The futures price trades at a **discount to spot**

Interest rates < Dividend yield → **Negative** cost of carry

The **fair value** of the basis is driven by the **cost of carry**, influenced by the relationship between **interest rates** and expected **dividends**

Different investors may calculate slightly **different fair values** for the basis depending on their **funding costs** and assumptions about **future dividends**

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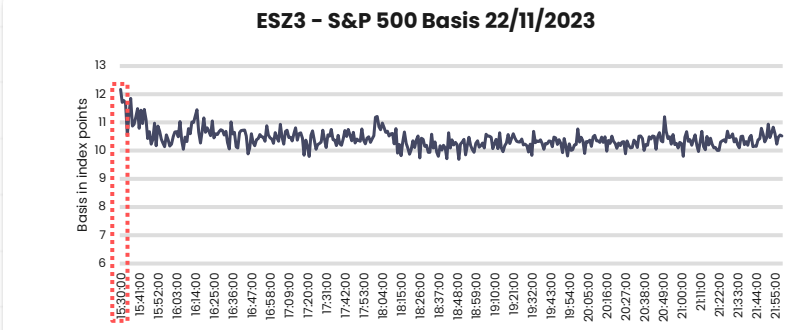
Arbitrage opportunities

Futures **below** fair value (basis is **"cheap"**)

Market participants can profit by **buying futures** and **shorting** the **index's underlying components**



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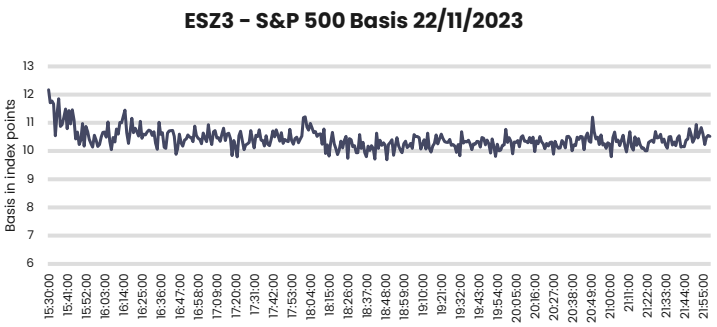
Arbitrage opportunities

Futures **above** fair value (basis is **"rich"**)

Market participants can profit by **selling futures** and **buying the index's underlying components**



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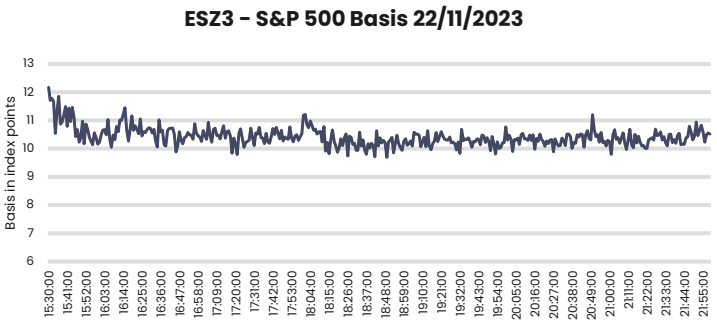
Arbitrage activities help keep the **basis** within a **narrow range**

The **narrow range** represents the **trading costs** of the **arbitrage trade**



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Hedging with Equity Index Futures - Pros and Cons

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Hedging with Equity Index Futures

Advantages

High liquidity in **index futures markets**

Narrow bid/offer spreads

Deep markets

Easier to **enter or exit** large positions

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Hedging with Equity Index Futures

Advantages

Market transparency

Trade on **regulated exchanges**

Prices are visible in **real-time**

Trading data is **publicly available**

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Hedging with Equity Index Futures

Advantages

Practically zero counterparty risk due to **central clearing**

Guaranteeing that **each party's obligations are met** even if one party defaults

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Hedging with Equity Index Futures

Advantages

Significant leverage

Large exposure with a relatively **small capital outlay**

Efficient use of **capital**

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Hedging with Equity Index Futures

Considerations

Portfolio constituents vs. index constituents – stability of beta

Crucial to **consider** how closely the **portfolio's constituents align with the index**

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Hedging with Equity Index Futures

Considerations

Interest rate and dividend exposure

Futures pricing incorporates the **cost of carry**

Any changes in these rates can affect the **futures price** and potentially **impact the hedge**

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Hedging with Equity Index Futures

Considerations

Basis and roll risk

Futures basis Can introduce **small discrepancies** in **hedging outcomes**

Futures contracts approach **expiration**

Investors may need to **roll their positions**

Extra costs or **exposure mismatches**

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