Derivatives - Options & Futures

Notes from the course offered by InteractiveBrokers

Jose A. Espino P.

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Contents

1 All About Options

Options often seem more daunting than many other asset classes. This is largely because they are **derivative instruments**, they involve special terminology, and they create different rights and obligations for buyers and sellers. However, this complexity is manageable if broken into simple pieces.

In broad terms, an option is a **derivative**—a financial instrument whose value is derived from the performance of something else. For an **equity option**, the underlying instrument is usually a stock, an exchange-traded fund, or a similar security.

The option itself is a contract that gives the buyer the **right, but not the obligation**, to buy or sell an underlying asset at a specified price by a specified date. The most common types are **calls** and **puts**.

From this definition, the essential pieces of an option contract are:

- the **underlying asset**,
- the **strike price**,
- the **expiration date**,
- whether it is a **call** or a **put**,
- and the **premium** paid or received.

An option does not have independent value in the way a stock does; its value depends on the behavior of the underlying asset. This is the **derivative nature** of options.

Imagine a financial product whose value depends on the future box office performance of a movie. An investor might buy a derivative that pays off if a film exceeds a certain revenue threshold in its opening weekend.
In this example, the movie derivative is not valuable because of the physical film itself, but rather due to what the movie eventually does in theaters. Similarly, an equity option doesn't derive value from being an stand-alone asset but rather from the future performance of its underlying instrument.
Suppose then that an investor believes a movie scheduled for release next summer is going to be a blockbuster. Before buying this movie derivative, the investor would research factors such as the people involved in the movie, their track records, the movie's distribution strategy, the number of screens, the marketing campaign, amongst others. The investor would also go check what the market thinks; if in this fictional market, there is heavy buying interest in the product and strong speculation that opening-weekend revenues will exceen $100 million, the investor would profit if this were to come true and they purchased the derivative. If they purchased and the movie underperforms, they lose the **premium** they paid.
This represents **the long side** of derivatives, being an option buyer. The buyer pays a premium upfront and hopes the underlying outcome moves in the needed direction. If it doesn't, the buyer's loss is limited to the premium paid.
If another investor then thinks the movie will underperform and that the hype is misleading, they might research some negative information to confirm this view, such as product delays, budget overruns, the possibility of missing the release date, or others. In this case, the trader would be willing to **accept the premium from a buyer**. If the movie ends up underperforming as expected, the seller earns the premium as profit; if the opposite outcome happens, the seller ends up on the wrong side of the trade and will face losses, even after having collected the premium.
This exemplifies those who choose to **short** or sell options; the writer receives a premium, but in exchange may assume obligations and potentially significant risk depending on the structure of the position.

The central challenge of options trading is that you are trying to evaluate how some underlying outcome will turn out in the future, and your position gains or loses value based on that outcome. In the specific case of **stock options**, the trader is generally trying to judge whether the underlying stock's price will rise or fall over a **limited time period**.
A trader of stock options would generally want to analyze a **multitude of factors** about the underlying stock in order to judge whether its price is likely to rise or fall over a specified time frame, such as

- **fundamental analysis**,
- **technical analysis**,
- **implied volatility**, and
- various **sensitivity values** (**Greeks**).

Beyond pure speculation, traders may use the equity options market for a variety of reasons, including:

- **speculation** on the future direction of the underlying,
- **income generation**,
- **hedging** existing positions,
- and **risk mitigation strategies**.

One of the key institutions in the options market is the **Options Clearing Corporation (OCC)**. OCC states that, **prior to buying or selling an option**, investors must read the document titled **Characteristics and Risks of Standardized Options**, which is commonly called the ODD. OCC explains that it describes the characteristics and risks of exchange-traded options. OCC also notes that broker-dealers are required to distribute the ODD to customers pursuant to SEC Rule 9b-1, and the Options Industry Council provides supporting resources such as an **ODD Quick Guide** and **Options Overview for Investors** to help investors navigate the document. The ODD provides important insights including:

- risks,
- margin-related topics,
- tax-related topics,
- and other structural aspects of standardized options.

1.1 Stock Options

Every standard listed option has two sides:

- a **buyer (holder / owner)**, and
- a **seller (writer)**.

The buyer receives **rights**; the seller assumes **obligations**.
A stock option is basically a **contract** involving a specified number of shares of a particular stock, at a **fixed price**, over a **defined period of time**. These contracts giving the owner the right to buy or sell an underlying asset at a fixed price on or before a specified future date.
A **call option** gives its holder the **right, but not the obligation, to buy** the underlying stock at a predetermined price over a given period of time. The call buyer has the right to buy the underlying asset at the strike price before expiration.
A **put option** gives its holder the **right, but not the obligation, to sell** the underlying stock at a predetermined price over a given period of time.
If you **purchase** an option contract, you become the **holder** or **owner** of that contract and are said to be **long** the option position. In this case, *all rights belong to the buyer, all obligations to the seller*. As the holder of the option, you receive the **right** to act under the contract, but you do **not** have an obligation to do so. This means:

- a call holder may buy the stock at the strike price,

- a put holder may sell the stock at the strike price,
- but the holder is never forced to exercise that right.

The option buyer pays a **premium** to the seller. This premium is effectively the **market price of the option contract**. The premium can fluctuate with market conditions. Option premiums move as the underlying price, time to expiration, and implied volatility change. So the premium is not a fixed fee set once forever; it is the **market value** of the option at a given moment.
During the life of the contract, the holder has several decisions that they could make:

- Exercise the option under the terms of the agreement (taking delivery of the underlying shares at the strike oprice for calls or delivering shares at strike price for puts)
- Let the contract lapse or expire. This tends to be the case for **out-of-the-money** options, which expire with no value.
- Sell the option to another buyer. The holder has the right to hold the option itself during the lifetime of the contract.

The buyer has **choice**. The buyer may exercise, close out the position by selling it, or let it expire. This flexibility is one of the defining features of being long an option.
On the other side of the contract is the **seller**, often called the **writer**, who is said to be **short** the option position. The seller or writer accepts the obligation to buy or sell if the purchaser exercises their right. The seller receives the **premium** from the buyer in exchange for taking on the contractual obligation.
Exercise is the action taken by the option holder to use their contractual right. An **assignment**, on the other hand, is what happens on the seller's side when a holder exercises. Once assignment is received, the investor has no alternative but to fulfill the contractual obligation. Note that,

Long option max loss = premium paid
Short option max gain = premium received

In options trading, the premium depends in part on the willingness of buyers and sellers to transact at a mutually agreeable price. This is consistent with the fact that options trade in markets with **bid** and **ask** prices, and the premium reflects actual market conditions rather than a permanently fixed contract value. That price can go up or down before expiration as the underlying price, time to expiration, and other factors change.
In the U.S., standard listed equity options generally use a **contract multiplier of 100 shares**. Each standard equity option contract covers **100 shares of the underlying security**. This means that the quoted premium is usually stated **per share**, but the total contract value must be multiplied by **100**.

If one contract has a quoted premium of **$0.11**, then the total premium actually paid for one contract is:

$$0.11 \times 100 = \$11$$

because one contract controls 100 shares. If you bought **three contracts**, then you would control:

$$3 \times 100 = 300 \text{ shares}$$

and the total premium would be:

$$3 \times 0.11 \times 100 = \$33$$

or, expressed in quoted per-share premium terms, **$0.33** across the three contracts before multiplying by the standard unit.

The concept of **moneyness** is important to evaluate the viability of a given options contract. For **call options**:

- calls with strike prices **below** the current stock price are said to be **in the money (ITM)**,
- while calls with strike prices **above** the current stock price are said to be **out of the money (OTM)**.

If a call strike is below the current stock price, the holder could exercise and buy the stock below market value, so the option has **intrinsic value**. If the call strike is above the stock price, exercising would make no economic sense at that moment, so the option has no intrinsic value under those conditions.
For **put options**:

- puts with strike prices **above** the current stock price are **in the money**,
- and puts with strike prices **below** the current stock price are **out of the money**.

Why this is so. A put gives the holder the right to **sell** at the strike price. Therefore, if the strike is above the current stock price, the holder could sell above market value, which creates intrinsic value. If the strike is below the stock price, there is no immediate economic benefit to exercising the put at that moment.
An **option class** is all the options with the same underlying security and type of option (call or put). **Option series** are those that have the same strike price and same expiration date under the same underlying security.

The aforementioned OCC serves as a **central counterparty** in the listed-options market, meaning it becomes the buyer to every seller and the seller to every buyer for the contracts it clears. OCC further states that, in this role, it guarantees that both sides of every cleared trade are fulfilled. This matters because it reduces direct counterparty risk between trading parties. If one side of a listed options transaction fails to perform, OCC's clearing and novation framework is designed to ensure the contractual obligations of the trade are still fulfilled. OCC explicitly describes itself as guarantor and central counterparty for the contracts it clears.
Some common reasons why investors engage in the options market are:

- **Lower-cost directional exposure.** Options offer **leverage**, meaning investors may gain exposure to movements in an underlying asset by paying only the premium rather than the full cost of buying the stock outright. An option premium can be only a fraction of the underlying asset's full price.
- **Income generation.** Options can be used to generate income, for example through selling options such as covered calls or puts.
- **Hedging and protection.** Options can be used to hedge upside or downside risk in a position or portfolio.
- **Speculation on a fixed time frame.** Options allow investors to take views on price movements in underlying assets over a defined period of time without owning the asset outright.

1.2 Put-call Parity

Some strategies may use different combinations of products yet end up with **very similar payoff diagrams**. This happens because the prices of puts and calls are **inextricably linked** to one another and to the price of the underlying stock through an equation known as **put-call parity**. Put-call parity is essentially the pricing relationship between a call and a put on the same underlying, with the same strike and expiration. Put-call parity is therefore a **no-arbitrage relationship**: if two combinations of instruments produce the same eventual payoff, then they should be priced consistently with one another. In a forward-value form, the relationship is:

$$\text{Call Price} + \text{Strike Price} = \text{Forward Value of Stock Price} + \text{Put Price}$$

Here, the stock term should be interpreted as the **forward value** of the stock rather than simply the current spot price. It is important to use the **forward-adjusted stock value** because the future economic value of holding stock through the option's life is influenced by:

- **interest rates**,
- **dividends**,
- and, in some cases, stock-specific financing considerations such as borrow effects.

Parity relationships are not just about the current spot price of stock, but about the economically comparable value of holding the stock through expiration.
Forward value, in turn, can be approximated as

$$\text{Forward Value} = (\text{Current Value}) \times \left(1 + \text{interest rate} \times \frac{\text{days until expiration}}{365}\right) - \text{dividends}$$

The logic is:

- if rates are positive, carrying the stock position through time has a financing effect,
- if the stock pays dividends before expiration, those dividends reduce the effective forward-equivalent stock value,

- and if borrowing conditions are unusual, the economic forward relationship may also differ from the simple spot price.

In a **low interest-rate environment**, if a stock pays **no dividends**, the forward value is roughly equal to the current stock price. But if rates are high, if the stock is hard to borrow, or if a dividend is expected during the life of the option, the forward value can differ **meaningfully** from the current stock price. Options investors cannot ignore dividends and interest rates when implementing strategies. Option prices are based on the **forward value** of the underlying product, so the effects of **interest rates** and **dividends** are crucial. Higher dividend yields tend to **depress call premiums and increase put premiums**, while higher interest rates tend to **increase call premiums and decrease put premiums**. This means an options trader who ignores:

- a stock's upcoming dividend,
- the interest-rate environment,
- or funding / borrowing conditions

may misunderstand why one option appears richer or cheaper than another.
The parity relationship can be rearranged as:

$$\text{Call Price} = (\text{Forward Value} - \text{Strike Price}) + \text{Put Price}$$

This shows the value of a call is the same as being **short the stock and long a put**—which can be generalised into different synthetic relationships. Indeed,

> *calls, puts, stock (or forward stock value), and the strike/funding leg can be recombined algebraically into economically equivalent structures.*

One of the practival results of this is:

$$\text{Forward Value} = \text{Strike Price} + \text{Call Price} - \text{Put Price}$$

When structured this way, a **long call** plus a **short put**, using the same strike and expiration, creates a **synthetic future**. This means that if an investor:

- buys a call,
- sells a put,
- and uses the same strike and expiry,

the net economic exposure resembles a forward-style directional exposure to the underlying.
Parity helps explain how the options marketplace maintains **fair pricing** between calls and puts on the same underlying, strike, and expiration. If those prices drift too far apart from their parity relationship, **arbitrage opportunities** can emerge. Competitive trading then pushes prices back toward equilibrium, narrowing any mispricing.
Put-call parity therefore helps traders:

- compare whether calls and puts are relatively expensive or cheap,

- understand why synthetic positions line up the way they do,
- and recognize that option pricing on the same underlying is linked across the market, not independent strike-by-strike guesswork.

1.3 Option Pricing

Options provide investors with **more leverage** than buying stock outright using the same capital, and therefore also involve **more risk**. This leverage exists because the investor pays only the option premium instead of the full stock purchase price; a move in the underlying asset can produce a percentage change in the option's value that is much larger than the percentage move in the stock itself. Option premiums are often only a fraction of the cost of the underlying, which is one reason options can behave in a highly leveraged manner.

Option premiums and changes in option values can be predicted through a pricing model such as **Black-Scholes**. Instead of going into detail for this or any of the other models used, let us look at the variables that are input to each of these models; thus, we can understand how a change in each of them ultimately affects an option's value. The following are standard inputs:

- **Strike price**,
- **Interest rate**,
- **Implied volatility**,
- **Underlying asset price**,
- **Time to expiration**.

The **strike price** is the predetermined price at which:

- a **call buyer** may buy the underlying from the seller,
- and a **put buyer** may sell the underlying to the seller.

> Given a company whose share price is approximately $32.90 and two calls, with one with a **$33 strike** and the other one with a **$35 strike**. Because the probability that the stock will rise to or through $33 is higher than the probability that it will reach $35 over the same period, the lower-strike call is more likely to acquire intrinsic value and therefore tends to be **more expensive**.

All else equal, as the strike price increases

- The value of a call decreases,
- the value of a put increases.

Interest rates, the second input mentioned, matter because investors choose between assets, and option valuation must account for the risk-free return available in instruments such as government securities. Put-call parity and synthetic-position material also show that interest rates affect the relative value of calls and puts through the cost of carrying the underlying versus the present value of the strike.
Higher interest rates generally tend to:

- **increase call values**,
- and **decrease put values**

because rates affect the economic trade-off between holding stock exposure directly and replicating it synthetically through options and financing relationships. The significance of interest rates in the current market may be fairly low. Rates always matter in theory, but in very low-rate environments they may move option values less dramatically than volatility or underlying price changes.

One of the most important pricing variables is **implied volatility**. The greater the forecasted future movement in the underlying, the greater the probability that the option may increase or decrease in value. Therefore, the greater the implied volatility, the greater the potential for the option's price to change. Implied volatility does **not** tell you whether prices will go **up** or **down**. It only suggests that prices may move more. In other words:

Implied volatility measures expected magnitude, not direction.

One should also not confuse **implied volatility** with **historical (historic) volatility**. Historical volatility measures realized past movement, whereas implied volatility is a market-implied estimate of future movement over the life of the option.
Because current option prices are visible in the market, traders can use an option pricing model to *back out* the level of implied volatility embedded in those prices. Knowing implied volatility across different underlyings, strikes, calls, and puts allows traders to compare options and assess whether relative pricing opportunities may exist.

The relationship between the **underlying asset price** and the **strike price** has a strong influence on option value.
For a **call option**, the higher the underlying asset price is relative to the strike price, the higher the call premium tends to be. That is because the payoff at exercise is based on the difference between the underlying price and the strike price, when positive. Call moneyness is classified as follows:

- underlying price below strike → **out of the money**,
- underlying price at strike → **at the money**,
- underlying price above strike → **in the money**.

For a **put option**, the lower the underlying asset price is relative to the strike price, the higher the put premium tends to be. Put moneyness works in the opposite direction:

- underlying price above strike → **out of the money**,
- underlying price at strike → **at the money**,
- underlying price below strike → **in the money**.

It is important to remember that, even if an option is in the money, the investor may still have a **net loss** once the premium paid (and possibly commissions) are taken into account. This is why moneyness and profitability are related but not identical concepts.

The **intrinsic value** of an option is only the amount by which it is **in the money** if it were to expire today. If it is at the money or out of the money, it has no current intrinsic value. For a call:

$$\text{Intrinsic Value} = \max(\text{Underlying Price} - \text{Strike Price}, 0)$$

For a put:

$$\text{Intrinsic Value} = \max(\text{Strike Price} - \text{Underlying Price}, 0)$$

If an option still has time remaining before expiration, it generally has **extrinsic value**. Extrinsic value represents the probability that the underlying may move in the future and thereby create or increase intrinsic value. An option's premium or market value is equal to:

$$\text{Option Premium} = \text{Intrinsic Value} + \text{Extrinsic Value}$$

At expiration, there is **no extrinsic value remaining**. Therefore:

$$\text{Option Value at Expiration} = \text{Intrinsic Value}$$

Option style also matters because it determines when an option can be exercised. American-style options can be exercised at any time prior to, up to, and including expiration. European-style options, on the other hand, can be exercised only **at expiration**.

Dividends too affect option pricing, especially when:

- the dividend amount changes, or
- the stock approaches the **ex-dividend date**.

Wwhen a stock goes ex-dividend, its price typically falls by roughly the amount of the dividend. That expected drop tends to:

- make **call options** somewhat less valuable,
- and make **put options** somewhat more valuable,

all else equal. This is why dividends are part of a full options-pricing framework.

1.4 The Greeks

The Greeks are a set of option **risk factors** used to monitor the profile of a position or a portfolio. By using the Greeks, it is easier to understand why some option prices are more/less responsive to changes in factors like the value of the underlying security, implied volatility, time to expiration, and interest rates.
The Greeks are not stand-alone concepts but rather directly derived from the inputs of option pricing models—they quantify how sensitive the option is to each input. They help answer practical questions such as:

- How much should the option price change if the stock price changes by $1?

- How fast is time decay eroding the option's value?
- How sensitive is the option to a change in implied volatility?
- How much do interest rates affect the option?

The Greeks are functions of the same variables that drive the option pricing model:

- underlying asset price S,
- strike price K,
- time to expiration T,
- implied volatility σ,
- and interest rate r.

Delta represents the theoretical change in an option's price for a $1 change in the price of the underlying asset. A useful finite-difference interpretation is:

$$\Delta \approx \frac{\Delta \text{Option Price}}{\Delta S}$$

where S is the price of the underlying asset.
For a call option:

$$0 \leq \Delta_{\text{call}} \leq 1$$

As the underlying price rises and the call moves further **in the money**, Delta increases and approaches 1. An **at-the-money** call generally has a Delta of about 0.5.
For a put option:

$$-1 \leq \Delta_{\text{put}} \leq 0$$

As the underlying price falls and the put moves further **in the money**, Delta becomes more negative and approaches -1. An at-the-money put generally has a Delta of about -0.5.
Delta may also be thought of as the approximate probability that the option will finish in the money; for puts, the **absolute value** of Delta is used in that interpretation. Delta is influenced by:

- underlying asset price,
- strike price,
- interest rate,
- implied volatility,
- and days to expiration.

Gamma represents the **rate of change of Delta** for a given change in the underlying asset's price. A useful approximation is:

$$\Gamma \approx \frac{\Delta(\Delta)}{\Delta S}$$

That is, Gamma measures how much Delta changes when the underlying changes.
The option's price path before expiration is not a flat straight line but a **curved line**. Delta

gives the slope at a particular point, while Gamma describes thecurvature and how the slope itself changes. Gamma is thus the **second-order derivative**.

Gamma is generally **largest at the money** and decreases as options move further **into the money** or **out of the money**. Gamma is especially important for traders trying to **continuously hedge** portfolios, because a Delta hedge does not remain fixed when the underlying moves.

If the underlying moves by ΔS, the new Delta can be approximated by:

$$\Delta_{\text{new}} \approx \Delta_{\text{old}} + \Gamma \cdot \Delta S$$

Theta describes the relationship between **time** and the **price of an option**—the approximate decline in an option's premium caused by the passage of time. A useful approximation is:

$$\Theta \approx \frac{\Delta \text{Option Price}}{\Delta t}$$

where Δt is the passage of time (often measured in days). Theta affects only the **extrinsic value** of an option. Intrinsic value does not *erode* with time; it changes only if the underlying price changes.

As expiration approaches, Theta becomes increasingly **negative**. The closer the option is to expiration, the less extrinsic value remains. Therefore, Theta measures the rate at which that remaining extrinsic value is declining. Theta is crucial because an option holder can be directionally correct and still lose money if time passes too quickly and the favorable move in the underlying is not large or fast enough to overcome time decay.

Vega represents the change in an option's price due to a change in **implied volatility**. A useful approximation is:

$$\text{Vega} \approx \frac{\Delta \text{Option Price}}{\Delta \sigma}$$

where $\Delta\sigma$ is a 1-percentage-point change in implied volatility. Vega is generally greatest for an **at-the-money** option and decreases as the underlying moves increasingly **into** or **out of the money**.

A 1% increase in implied volatility should change the option's price by approximately the amount suggested by Vega, all else equal. Vega measures sensitivity to the **magnitude of expected movement**, not the direction of the underlying. A rise in implied volatility means the market expects bigger moves, not necessarily higher or lower prices.

Rho represents an option's price sensitivity to **interest rates**. A useful approximation is:

$$\text{Rho} \approx \frac{\Delta \text{Option Price}}{\Delta r}$$

where Δr is a 1-percentage-point change in interest rates. The greater the underlying asset price and the greater the remaining days to expiration, the greater the Rho tends to be.

11. Worked Example from the Lesson

Assume the following:

- share price $S = \$35.90$,
- strike price $K = \$40.00$,
- interest rate $r = 4\%$,
- implied volatility $\sigma = 38.8\%$,
- time to expiration $T = 38$ days.

Under those assumptions, the call option price is approximately:

$$C \approx \$0.5388$$

or about \$0.54. Then, the Greek values would be:

$$\Delta = 0.2214$$

for every \$1 move in the underlying, the option changes by about \$0.22, ignoring Gamma. This is roughly a 22% chance of finishing at or above the strike.

$$\Gamma = 0.0661$$

if the stock rises by \$1, Delta rises by about 0.0661, or about 6.6 cents.

$$\Theta = -0.0184$$

$\Theta = -0.0184$: the option loses about 1.84 cents of value per day from time decay.

$$\text{Vega} = 0.0344$$

if implied volatility rises from 38.8% to 39.8%, the option gains about 3.44 cents.

$$\text{Rho} = 0.0077$$

if interest rates rise from 4% to 5%, the option gains about 0.77 cents.

The Greeks are not only useful for individual options analysis but also for **portfolio-level exposure**. A portfolio of options can be viewed as having aggregate Delta, Gamma, Theta, Vega, and Rho exposure, and those measures are often used by traders to understand the portfolio's directional, time, volatility, and rate sensitivities.

2 Strategies for Options Trading

1. Bull Market Long Call

A **long call strategy** is appropriate when an investor is **bullish** on the market or on a specific stock and wants to profit from a rise in the underlying without buying the stock outright.
If the stock price at expiration is S_T, the strike is K, and the premium paid is c_0, then:

Long call payoff at expiration:

$$\text{Payoff}_{\text{Long Call}} = \max(S_T - K, 0)$$

Long call profit at expiration:

$$\text{Profit}_{\text{Long Call}} = \max(S_T - K, 0) - c_0$$

This is the standard long-call profit formula.

Break-even:

$$\text{Break-even} = K + c_0$$

The long call begins making net profit only once the stock price rises above the strike plus the premium paid.

Maximum profit:

$$\text{Max Profit} = \text{Unlimited}$$

Because the stock price can theoretically rise without limit, the profit potential of a long call is theoretically unlimited.

Maximum loss:

$$\text{Max Loss} = c_0$$

The long call buyer can lose at most the premium paid if the option expires worthless.

Imagine a security as follows:

- Underlying stock price: \$46.25
- Call strike price: \$50.00
- Call premium: \$1.50
- Days to expiration: 90

Break-even:

$$50.00 + 1.50 = 51.50$$

Example profit at $S_T = \$55.00$:

$$\text{Profit} = 55.00 - 50.00 - 1.50 = 3.50$$

Maximum loss:

$$\text{Max Loss} = 1.50$$

This occurs at the strike price and at all prices below the strike at expiration, because the option will either be worthless or not worth exercising.

Long Call Strategy Characteristics

- **Market outlook:** Bullish
- **Volatility view:** Higher implied volatility tends to **increase** the option premium and helps a long call
- **Time erosion:** Hurts the position because the option loses extrinsic value over time
- **Dividends:** Tend to reduce call premium
- **Interest rates:** Tend to increase call premium
- **Profit potential:** Unlimited
- **Loss potential:** Limited to premium paid
- **Components:** Buy call option

2. Bull Market Short Put

A **short put** means selling a put option and receiving a premium in exchange for taking on the obligation to buy the underlying at the strike price if assigned. A short put is typically considered by a **risk-tolerant bullish trader** who believes:

- the stock price will rise, or
- at least remain above the strike price,

- and possibly that implied volatility may decline.

If the stock price at expiration is S_T, the strike is K, and the premium received is p_0, then:

Short put payoff at expiration:

$$\text{Payoff}_{\text{Short Put}} = -\max(K - S_T, 0)$$

Short put profit at expiration:

$$\text{Profit}_{\text{Short Put}} = p_0 - \max(K - S_T, 0)$$

This is the standard short-put profit formula.

Break-even:

$$\text{Break-even} = K - p_0$$

Maximum gain:

$$\text{Max Gain} = p_0$$

This occurs when the option expires worthless, which is at the strike price or any higher stock price at expiration.

Maximum loss: The maximum loss is **substantial**, but not infinite, because a stock cannot fall below zero:

$$\text{Max Loss} = K - p_0$$

on a per-share basis if the stock falls to zero. This is the usual worst-case interpretation of a naked short put at expiration.

Imagine the following:

- Underlying stock price: \$60.25
- Put strike price: \$57.50
- Put premium received: \$2.00
- Days to expiration: 90

Break-even:

$$57.50 - 2.00 = 55.50$$

Profit at $S_T = \$60.00$: The put expires out of the money and worthless:

$$\text{Profit} = 2.00$$

Profit at $S_T = \$57.50$: The put is at the money at expiration and has zero intrinsic value:

$$\text{Profit} = 2.00$$

Profit at $S_T = \$54.00$: The put is in the money by:

$$57.50 - 54.00 = 3.50$$

So the short put seller's profit is:

$$2.00 - 3.50 = -1.50$$

Short Put Strategy Characteristics

- **Market outlook:** Bullish
- **Volatility view:** Premium tends to decrease when implied volatility falls, which helps the short put seller
- **Time erosion:** Helps the short put seller because extrinsic value decays
- **Dividends:** Ddividend effects must be considered through option pricing relationships
- **Interest rates:** Higher rates tend to increase put/call relative pricing effects in ways that must be understood from pricing models; premium increases is a simplified approach.
- **Profit potential:** Limited to premium received
- **Loss potential:** Substantial
- **Components:** Sell put option

3. Bull Market Covered Call

A **covered call** consists of:

- owning the underlying stock,
- and simultaneously selling a call option against that stock on a share-for-share basis.

Here, the position is *covered* because the investor already owns the shares and can therefore deliver them if the short call is assigned. A covered call is usually considered by someone who:

- is bullish on the stock's **long-term prospects**,
- but is only **mildly bullish or neutral** over the life of the option,
- and wants to generate **additional income** by receiving call premium.

The covered call consists of two legs:

$$\text{Covered Call} = \text{Long Stock} + \text{Short Call}$$

Its payoff at expiration can be written as:

$$\text{Profit}_{\text{Covered Call}} = (S_T - S_0) + c_0 - \max(S_T - K, 0)$$

where:

- S_0 = original stock purchase price,
- S_T = stock price at expiration,
- K = call strike,
- c_0 = call premium received.

This profit decomposition follows directly from long stock plus short call.

Break-even:

$$\text{Break-even} = S_0 - c_0$$

That is, the premium received lowers the effective stock cost basis.

Maximum gain:

$$\text{Max Gain} = (K - S_0) + c_0$$

This occurs if the stock finishes at or above the strike at expiration, because any further stock gain is offset penny-for-penny by the rising obligation on the short call.

Maximum loss: If the stock falls to zero, the covered-call investor still loses almost the full stock value, offset only by the premium received:

$$\text{Max Loss} = S_0 - c_0$$

on a per-share basis if the stock goes to zero.

Given the following:

- Underlying stock purchase price: \$50.00
- Call strike price: \$55.00
- Call premium received: \$1.75
- Days to expiration: 90

Break-even:

$$50.00 - 1.75 = 48.25$$

Profit at $S_T = \$54.00$: Stock gain:

$$54.00 - 50.00 = 4.00$$

Plus premium received:

$$4.00 + 1.75 = 5.75$$

Profit at $S_T = \$55.00$: Stock gain:

$$55.00 - 50.00 = 5.00$$

Plus premium:

$$5.00 + 1.75 = 6.75$$

This is the **maximum profit**. Above the strike, further stock gains are offset by losses on the short call.

Loss at $S_T = \$44.00$: Stock loss:

$$50.00 - 44.00 = 6.00$$

Offset by premium received:

$$6.00 - 1.75 = 4.25$$

So the net loss is:

$$-4.25$$

Covered Call Strategy Characteristics

- **Market outlook:** Mildly bullish / bullish-neutral
- **Volatility view:** Decreasing volatility generally helps the short call leg
- **Time erosion:** Helps, because the short call benefits from time decay
- **Dividends:** An increase in dividends helps covered-call writers; dividend effects matter because they affect call valuation and assignment incentives
- **Interest rates:** in pricing terms, rates affect option valuation and covered-call economics through the short call
- **Profit potential:** Limited to stock appreciation up to the strike plus premium received
- **Loss potential:** Substantial downside risk from the stock, partially reduced by the premium
- **Components:** Long stock + short call option

The covered call has a **similar profile to a short put**. This is a standard options equivalence idea and is consistent with put-call parity / synthetic-position logic: long stock + short call has a payoff shape closely related to a short put at the same strike and expiration.

4. Bear Market Long Put

A **long put strategy** is appropriate for an investor who is:

- bearish on the overall market, or
- bearish on a specific stock.

The long put benefits from a decline in the underlying stock price. The investor pays a fixed **premium** upfront, which represents the maximum possible loss. Let:

- S_T = underlying stock price at expiration,
- K = put strike price,
- p_0 = premium paid.

Long put payoff at expiration:

$$\text{Payoff}_{\text{Long Put}} = \max(K - S_T, 0)$$

Long put profit at expiration:

$$\text{Profit}_{\text{Long Put}} = \max(K - S_T, 0) - p_0$$

Break-even:

$$\text{Break-even} = K - p_0$$

Maximum profit: Profit is **limited but substantial**, increasing point-for-point as the stock price falls, but capped because the stock price cannot fall below zero:

$$\text{Max Profit} = K - p_0 \quad (\text{when } S_T = 0)$$

Maximum loss:

$$\text{Max Loss} = p_0$$

This occurs at the strike price and all prices above the strike at expiration.

Given

- Underlying stock price: \$36.25
- Put strike price: \$35.00
- Put premium: \$2.00
- Days to expiration: 90

Break-even:

$$35.00 - 2.00 = 33.00$$

Profit at $S_T = \$30.00$:

$$\text{Profit} = 35.00 - 30.00 - 2.00 = 3.00$$

Maximum loss:

$$\text{Max Loss} = 2.00$$

Long Put Strategy Characteristics

- **Market outlook:** Bearish
- **Volatility view:** Premium increases (helps long put)
- **Time erosion:** Hurts (premium decays)
- **Dividends:** Premium increases
- **Interest rates:** Premium decreases
- **Profit potential:** Limited but substantial
- **Loss potential:** Limited to premium paid
- **Components:** Buy put option

5. Bear Market Covered Put

A **covered put** combines:

- a **short stock position**, and
- a **short put option** on the same underlying.

$$\text{Covered Put} = \text{Short Stock} + \text{Short Put}$$

This strategy is typically used by an investor who:

- is bearish on the stock's long-term prospects,
- wants to generate **income** from option premium,
- is willing to cap downside gains below the strike price.

The strategy has a payoff profile similar to a **short call**. Let:

- S_0 = initial stock sale price,
- S_T = stock price at expiration,
- K = put strike price,
- p_0 = premium received.

Covered put profit at expiration:

$$\text{Profit}_{\text{Covered Put}} = (S_0 - S_T) + p_0 - \max(K - S_T, 0)$$

Break-even:

$$\text{Break-even} = S_0 + p_0$$

Maximum gain:

$$\text{Max Gain} = (S_0 - K) + p_0$$

Occurs when the stock price finishes at or below the strike.

Maximum loss:

$$\text{Max Loss} = \text{Unlimited}$$

Because the stock price can rise indefinitely.

Given:

- Underlying stock price: \$40.00
- Put strike price: \$37.50
- Put premium received: \$2.00
- Days to expiration: 90

Break-even:

$$40.00 + 2.00 = 42.00$$

Maximum profit at $S_T = \$37.50$:

$$(40.00 - 37.50) + 2.00 = 4.50$$

Profit at $S_T = \$35.00$:

$$\begin{aligned} \text{Stock gain} &= 40.00 - 35.00 = 5.00 \\ \text{Put intrinsic value} &= 37.50 - 35.00 = 2.50 \\ \text{Net option loss} &= 2.00 - 2.50 = -0.50 \\ \text{Total profit} &= 5.00 - 0.50 = 4.50 \end{aligned}$$

Loss at $S_T = \$44.00$:

$$(44.00 - 40.00) - 2.00 = 2.00$$

Covered Put Strategy Characteristics

- **Market outlook:** Mildly bearish
- **Volatility view:** Premium decreases (helps)
- **Time erosion:** Helps
- **Dividends:** Premium decreases
- **Interest rates:** Premium increases
- **Profit potential:** Limited
- **Loss potential:** Unlimited
- **Components:** Short stock + short put

2.1 Neutral Market Strategies

These strategies are optimal when the underlying asset is expected to experience relatively small price movements and when the implied volatility is expected to diminish. The one who executes these strategies is betting on low volatility while the other party would be betting on the opposite.

1. Short Straddle

A **short straddle** is created by **selling a call** and **selling a put** with:

- the **same strike price**,
- the **same expiration date**,
- and the **same underlying asset**.

In compact form:

$$\text{Short Straddle} = \text{Short Call}(K, T) + \text{Short Put}(K, T)$$

where K is the common strike and T is the common expiration.

The short straddle seller is hoping for a **lack of movement** in the price of the underlying shares and is largely **indifferent to direction**, as long as the underlying remains close enough to the strike. It is a fairly pure bet on **decreasing implied volatility** and on a **lack of movement** in the underlying equity.

Because the trader sells both the call and the put, the trader receives an upfront **net credit** equal to the total premiums collected. This credit is also the strategy's **maximum possible profit**. The short straddle reaches its **maximum gain** if the stock closes **exactly at the strike price at expiration**, because then both options expire worthless and the seller keeps the entire credit.
Let:

- S_T = stock price at expiration,
- K = common strike,
- c_0 = call premium received,
- p_0 = put premium received,
- $C = c_0 + p_0$ = total credit received.

Short straddle payoff at expiration:

$$\text{Payoff}_{\text{Short Straddle}} = -\max(S_T - K, 0) - \max(K - S_T, 0)$$

Because only one side can be in the money at expiration, this simplifies to:

$$\text{Payoff}_{\text{Short Straddle}} = -|S_T - K|$$

Short straddle profit at expiration:

$$\text{Profit}_{\text{Short Straddle}} = C - |S_T - K|$$

This captures the central idea of the strategy: the seller keeps the credit as long as the stock's movement away from the strike stays within that amount.

Breakeven Points

The short straddle has **two breakeven points**:

$$\text{Upper Breakeven} = K + C$$

$$\text{Lower Breakeven} = K - C$$

If the stock stays between those two values at expiration, the trade is profitable. Outside that interval, the trader begins to lose money.

Maximum gain:

$$\text{Max Gain} = C$$

This occurs if:

$$S_T = K$$

at expiration.

Maximum loss: The strategy has:

- **unlimited loss to the upside**, because the short call loses dollar-for-dollar as the stock rises indefinitely,
- and **substantial downside loss**, because the short put loses dollar-for-dollar as the stock falls, limited only by the fact that a stock price cannot fall below zero.

Given:

- Underlying stock price: \$50.00
- Call strike: \$50.00
- Call premium received: \$5.00
- Put strike: \$50.00
- Put premium received: \$5.00
- Days to expiration: 90

Total credit received:

$$C = 5.00 + 5.00 = 10.00$$

Breakevens:

$$\text{Upper Breakeven} = 50.00 + 10.00 = 60.00$$

$$\text{Lower Breakeven} = 50.00 - 10.00 = 40.00$$

Maximum gain:

$$\text{Max Gain} = 10.00$$

at:

$$S_T = 50.00$$

Profit at $S_T = \$55.00$: The put is worthless, the call is in the money by \$5.00:

$$\text{Profit} = 10.00 - 5.00 = 5.00$$

Profit at $S_T = \$60.00$: The call is in the money by \$10.00:

$$\text{Profit} = 10.00 - 10.00 = 0$$

Thus, when the stock is below the strike, the call is worthless and the put begins to erode the premium. For example, if the put intrinsic value exceeds the total credit, the trader moves into loss. The supplied text's arithmetic intends to show exactly this relationship, even though one of the typed stock-price values appears inconsistent with the intrinsic-value calculation in the sentence. The correct logic remains:

$$\text{Profit} = 10.00 - (50.00 - S_T)$$

for stock prices below the strike.

Short Straddle Characteristics

- **Market outlook:** Neutral

- **Volatility view:** Decreasing volatility helps; implied-volatility decline tends to reduce premiums
- **Time erosion:** Helps the seller; time decay reduces premium
- **Dividends:** Often treated as neutral in the lesson summary
- **Interest rates:** Often treated as neutral in the lesson summary
- **Profit potential:** Limited
- **Loss potential:** Substantial from the short put; unlimited from the short call
- **Components:** Sell same-strike call and put with same expiration

2. Short Strangle

A **short strangle** is similar to a short straddle, except the call and put strikes are **different**. It consists of selling a call and a put on the same underlying with the same expiration but **different strike prices**, typically both out of the money. In compact form:

$$\text{Short Strangle} = \text{Short Call}(K_c, T) + \text{Short Put}(K_p, T)$$

where:

$$K_p < K_c$$

and both options share the same expiration T. The short strangle is also a **neutral**, **premium-selling**, **decreasing-volatility** trade. It benefits from decay and reduced volatility regardless of direction. Because the call and put strikes are placed **further apart** than in a short straddle, the underlying has more room to move before the seller begins to lose money. This lower risk does come with a trade-off: the trader receives a **lower premium** at the outset. So:

- **Short straddle** = more premium, narrower profit range, higher risk near the center
- **Short strangle** = less premium, wider profit range, somewhat lower risk of immediate loss

though both remain advanced risk-selling strategies. Let:

- K_c = call strike,
- K_p = put strike,
- c_0 = call premium received,
- p_0 = put premium received,
- $C = c_0 + p_0$ = total credit received.

Short strangle payoff at expiration:

$$\text{Payoff}_{\text{Short Strangle}} = -\max(S_T - K_c, 0) - \max(K_p - S_T, 0)$$

Short strangle profit at expiration:

$$\text{Profit}_{\text{Short Strangle}} = C - \max(S_T - K_c, 0) - \max(K_p - S_T, 0)$$

Breakeven Points

The short strangle also has **two breakeven points**. IBKR gives them as:

$$\text{Upper Breakeven} = K_c + C$$

$$\text{Lower Breakeven} = K_p - C$$

The trade is profitable if the stock finishes:

$$K_p - C < S_T < K_c + C$$

and maximum profit is achieved if the stock finishes between the two strikes.

Maximum gain:

$$\text{Max Gain} = C$$

This occurs when the stock closes between the two strikes, because both options expire worthless.

Maximum loss:

- **Upside loss is unlimited**, because the short call loses dollar-for-dollar as the stock rises indefinitely.
- **Downside loss is substantial**, because the short put loses dollar-for-dollar as the stock falls, limited only by the fact that the stock cannot go below zero.

Take a look at the following:

- Underlying stock price: \$80.00
- Call strike: \$85.00
- Call premium: \$3.00
- Put strike: \$75.00
- Put premium: \$2.50
- Days to expiration: 90

Total credit:

$$C = 3.00 + 2.50 = 5.50$$

Breakevens:

$$\text{Upper Breakeven} = 85.00 + 5.50 = 92.50$$

$$\text{Lower Breakeven} = 75.00 - 5.50 = 69.50$$

Maximum gain:

$$\text{Max Gain} = 5.50$$

This is earned if the stock finishes anywhere between \$75.00 and \$85.00.

Profit at $S_T = \$80.00$: Both options are out of the money:

$$\text{Profit} = 5.50$$

Profit / loss at $S_T = \$60.00$: The call is worthless. The put is in the money by:

$$75.00 - 60.00 = 15.00$$

So:

$$\text{Profit} = 5.50 - 15.00 = -9.50$$

Short Strangle Characteristics

- **Market outlook:** Neutral
- **Volatility view:** Decreasing volatility helps; premium declines
- **Time erosion:** Helps; time decay reduces the option premiums
- **Dividends:** Often simplified as neutral
- **Interest rates:** Often simplified as neutral
- **Profit potential:** Limited to initial premium received

- **Loss potential:** Substantial from short put / unlimited from short call
- **Components:** Sell lower-strike put and higher-strike call with same expiration

3 The Futures Market

A **forward market** is a marketplace in which participants agree today on the purchase or sale of products that will only be produced, delivered, or become available at some future date. Forward or *to-arrive* contracts began trading at the Chicago Board of Trade almost immediately after its founding in **1848**—long predating modern exchange-traded futures. Futures-style trading actually evolved out of early grain markets where merchants and producers needed ways to transact for future delivery under pre-agreed terms. Whether the participant is:

- a **speculator** willing to assume risk in pursuit of profit, or
- a **hedger** trying to protect a position,

futures allow that participant to **lock in prevailing prices**. Futures are widely used for both **hedging** and **speculation**.

The forward or futures price must take into account multiple factors that can influence the value of the product, and the structure of the final product, whether **physical** or **purely financial**, must be clearly specified in the contract. That standadisation was one of the key reasons futures contracts became broadly useful: exchange-listed contracts specify details such as **quality**, **quantity**, and other obligations that buyers and sellers must honor. Standardisation makes contracts easier to trade and compare, and it allows a larger group of producers, hedgers, investors, and speculators to participate in the same marketplace.

Over many decades, exchange-traded futures contracts have grown into popular investment vehicles. Futures trading has expanded far beyond its original agricultural roots into a broad range of modern products used across commodities, currencies, fixed income, and equity index markets.

Futures traditionally have a two-fold economic role:

- **producers / sellers** may want to lock in prices high enough to protect profit margins or at least cover production costs, while
- **end users / buyers** may want to hedge against rising prices to control input costs.

Many, many asset classes currently trade as futures. Some examples are

- **Metals**, such as gold and silver,
- **Energy products**, such as crude oil and natural gas,
- **Agricultural grains**, such as corn, soybeans, and rice,
- **Soft commodities**, such as coffee, cocoa, sugar, and orange juice,
- and **financial futures**, including interest rates, currencies, and equity indices.

The more producers, buyers, sellers, and hedgers who interact in a futures market, the more **speculators** are drawn in, which creates additional **liquidity** and generally improves market conditions. Indeed, futures markets became broadly useful precisely because standardisation and central trading venues allowed many categories of participants to transact in the same contracts.

Futures, like options, are **derivatives**. The US Congress' overview of derivatives defines a derivative as a contract whose value is derived from an underlying asset at a designated point in time, and explicitly lists **futures**, **options**, and **swaps** as examples. This means futures inherit risk from the underlying asset or financial variable they reference. Because futures derive their value from other products such as **equities**, **bonds**, **currencies**, or **commodities**, they bring along the inherent risks of those underlying markets.

Futures markets help mitigate **counterparty risk**. Any normal financial transaction involves a willing buyer and a willing seller, but this raises the question of whether one side may fail on the trade.The purpose of the exchange model is to remove direct counterparty risk by transferring it to a single exchange-backed entity. CME Clearing describes this directly: as the **central counterparty**, CME Clearing becomes the **buyer to every seller** and the **seller to every buyer**. CME's clearing overview says this mitigates counterparty credit risk and guarantees the financial performance of cleared trades. The Federal Reserve Bank of Chicago's explanation of central counterparty clearing describes the same mechanism as **novation**, where the CCP interposes itself between the original parties to ensure performance. This structure alleviates **settlement risk**: participants do not need to evaluate the financial quality or capitalization of the exact person or firm on the other side of the trade. That evaluation is handled centrally by the exchange / clearing structure. Clearing members must, however, meet capital requirements, provide margin and guaranty resources, and participate in a broader financial safeguards framework that supports the market as a whole.

To further safeguard the futures market, the **Commodity Futures Trading Commission (CFTC)** was created. The CFTC's official history states that it was founded in **1974** with the enactment of the Commodity Futures Trading Commission Act as an independent federal agency with the mandate to regulate commodity futures and options markets in the United States. The CFTC works to ensure the integrity of futures-market pricing and aims to prevent abusive trading practices and fraud while regulating brokers that participate in futures trading. The agency also aims to protect market users and the public from **fraud**, **manipulation**, **abusive practices**, and systemic risk, while fostering open and financially sound markets.

3.1 Futures Pricing

The **spot price** is the current price at which a physical commodity can be purchased for delivery at a specific location. It is settled by a spot market on a spot basis, meaning effectively for immediate delivery. The **futures price** is the agreed price for a standardised quantity to be delivered or financially settled at a future date.

Futures allow market participants to see the current price of a product **not yet produced**; they pull in all known information about future supply and demand conditions and express that through a **price discovery** process. Participants such as producers, hedgers, and speculators interact almost continuously so that new information can be rapidly incorporated into futures prices. This means that futures prices are not simply *guesses* about the future. They are the

output of an organized market process in which many participants continuously express their information, expectations, and hedging needs. This is why futures prices are important not only to traders, but also to producers, consumers, policymakers, and physical-market participants.
In futures trading, the **basis** is the difference between the **cash (spot) price** and the **forward or futures price**.

$$\text{Basis} = \text{Spot Price} - \text{Futures Price}$$

Using the above convention:

- If Basis > 0, the spot price is above the futures price.
- If Basis < 0, the futures price is above the spot price.

Changes in the basis send important signals to producers. For example, if forward prices indicate too much supply of a specific commodity at a future date, a farmer may choose to switch to another crop. The basis is therefore an economically meaningful indicator of the relationship between current physical-market conditions and expected future conditions.
Forward prices tend to be higher than current prices because of factors like inflation, insurance, storage, and investor psychology. Often, this is analysed through the **cost of carry**: for physically delivered contracts, later-dated futures can trade above spot because carrying the underlying over time involves **storage**, **financing**, and **insurance** costs.

Contango

Contango is the condition where **forward prices are higher than current prices**, producing an **upward-sloping forward curve**.Contango is the **usual** situation, especially in physically delivered markets, because of all the aforementioned factors (e.g. cost of carry, inflation). In contango, the forward curve slopes upward:

$$F(T_2) > F(T_1) > S$$

for longer and longer maturities $T_2 > T_1$, assuming a standard upward-sloping term structure.

Backwardation

When forward prices fall **below** the current market price, the market is in **backwardation**, which produces a **downward-sloping** or **inverted** forward curve. Backwardation may occur when there is a **near-term shortage** of the product, while production is expected to resume or recover later, when near-term demand is strong or inventories are low, so immediate or near-dated supply is especially valuable. Backwardation in physical commodities may reflect a benefit to owning the physical material now, called **convenience yield**. Convenience yield's an implied return on inventory and tends to be higher when inventories are low. In backwardation, the forward curve slopes downward:

$$F(T_2) < F(T_1) < S$$

for a typical inverted term structure.
Futures and spot prices must **converge** as expiration approaches, otherwise an arbitrage op-

portunity would exist. That is a central principle of futures pricing. In simple terms:

$$\lim_{T \to 0} F(T) = S$$

where $F(T)$ is the futures price approaching expiration and S is the spot price. The futures-price / spot-price difference cannot remain permanently disconnected at expiry because the contract is about to settle into the underlying or its cash equivalent.
The shape of the forward curve carries useful information:

- **Contango** often signals normal carrying costs, ample supply, or weak near-term demand.
- **Backwardation** often signals near-term scarcity, urgent demand, or low inventories.

A futures contract is a **legally binding agreement** to buy or sell a **standardised asset** on a specific date or during a specific month, facilitated through a futures exchange. In the futures market, the exchange defines product requirements in advance so everyone is trading the **same contract specification**. Every exchange-traded futures contract specifies the **quality**, **quantity**, **physical delivery time**, and **delivery location** for the product. Because the contract specifications are identical for all participants, it does not matter who the buyer or seller is at a given moment. The only contract variable that changes in trading is **price**—which is discovered through bidding and offering until a trade occurs. Every standardized futures contract identifies at least:

- the **underlying asset**,
- the **quantity** of that asset (contract size),
- the **delivery location**,
- and the **delivery date or month**.

If the underlying asset is a physical commodity, the exchange also defines acceptable **grades** or **quality characteristics**.
All futures contracts also have a specified date on which they **expire**, and that prior to expiration traders may:

- close the position,
- extend / roll the position,
- or hold the contract into settlement.

Settlement may occur as:

- **physical delivery** of the underlying commodity, or
- **cash settlement**, in which the contract is settled through a final credit or debit instead of delivery.

In reality, only a **small percentage** of commodity futures contracts are physically delivered. In most cases, traders close or roll positions before delivery, while producers and end users are more likely to go through the physical-delivery chain if that matches their commercial needs.

Each contract being traded has a **lifecycle**. The exchange specifies when a contract **initiates** trading, when it **terminates** trading, and when delivery or settlement occurs within the contract month. Investors generally do not hold contracts until expiration; instead, they migrate to the next actively traded month.

Most futures contracts require investors to post margin with their broker as a **good-faith deposit** intended to help ensure that investors comply with exchange rules. Futures margin is **not** a down payment and does **not** mean the trader owns the underlying commodity. Margin exists because futures contracts are leveraged instruments. Futures margin typically represents a much smaller percentage of the contract's notional value than stock-purchase margin, often around **3% to 12%** of the contract value depending on the product. This allows a trader to control a large notional exposure with a relatively small amount of posted collateral. The exchange monitors the price variation of its contracts and sets margin according to the **volatility** of each underlying. When daily price moves become more volatile, margin requirements typically **increase**; when markets calm down, margin requirements may **decrease**. There are two main types of futures margin:

- **Initial Margin**: the amount required to open a position,
- **Maintenance Margin**: the minimum amount that must be maintained in the account to keep the position open.

If account equity falls below the maintenance margin level, the trader may:

- receive a **margin call**,
- be required to add funds immediately,
- reduce the position,
- or face automatic liquidation if the shortfall is not corrected.

The exchange is typically **ambivalent** to long and short positions and charges the **same margin requirement either way**. Exchanges typically calculate product price thresholds or maximum permitted daily price moves and use the value of that price change as the basis for required margin. If a contract were to move by its maximum permitted amount and trading were halted, an investor holding a long position would face losses equal to the margin requirement. Margins are designed to cover **at least 99% of anticipated price changes** over a liquidation period and are based on both historical and forward-looking volatility, product liquid

Futures are considered efficient because they provide **efficient** and relatively **low-cost** investment opportunities for hedging and speculation without ever owning the underlying. Futures allow for

- low commissions,
- broad global market access,
- and efficient capital use through margin.

More info on the OCC

The Options Clearing Corporation (OCC) describes itself as the **world's largest equity derivatives clearing organization**. It was founded in **1973** and is dedicated to promoting stability and market integrity by delivering clearing and settlement services for **options, futures, and securities lending transactions**. OCC also states that it operates as a **Systemically Important Financial Market Utility (SIFMU)** and is under the jurisdiction of the **SEC**, the **CFTC**, and the **Board of Governors of the Federal Reserve System**.
OCC explains that, in its role as a **central counterparty (CCP)**, it serves as the **buyer to every seller and the seller to every buyer** of the contracts it clears, thereby **guaranteeing that both sides of every trade are fulfilled**. OCC also describes this as a **novation process**, through which it steps between counterparties and protects market participants from direct bilateral counterparty risk.
OCC explains that its clearing model is supported by:

- **membership standards**,
- **margin requirements**,
- **collateral**,
- and a substantial **clearing fund**.

The ODD itself also notes that clearing members must meet OCC financial requirements, provide collateral for writer positions they carry, and contribute to funds that protect OCC against clearing-member failure. This means OCC does not merely *match trades*—it operates an organized risk-control framework around listed options, which is one reason standardized options markets can function at large scale.