

AA-12

OPTIONS
PRICING & GREEKS

Implied volatility and the five Greeks — Part 2 of the options course.

Alpha Academy · Team Alpha Trading

Options A–Z, Part 2: Pricing & the Greeks

In Part 1 you learned what an option is. This chapter answers the next question every beginner asks: *why did my option's price move — and why did it sometimes move the "wrong" way?*

Here is the puzzle. You buy a call because you think a stock will rise. The stock rises — and your option barely gains, or even loses money. Or the stock sits perfectly still, and your option quietly bleeds value every single day. Nothing is broken. Your option's price is being pushed by several forces at once, and the stock's price is only one of them.

By the end of this chapter you will know the five ingredients that set an option's price, what **implied volatility** really means, and how to read the five measurements traders call **the Greeks** — the dashboard gauges that tell you, in advance, roughly how your option will behave. This is the chapter that turns option buying from guessing into planning.

> **NOTE**
> This chapter is education only, not financial advice. The Greeks are estimates based on pricing models, not guarantees — real prices can and do move differently. Use them to understand risk, not to predict the future.

What Sets an Option's Price: Five Ingredients

Recall from Part 1: **premium = intrinsic value + extrinsic value**. Intrinsic value is the built-in advantage of the strike. Extrinsic value is the payment for time and possibility. Five ingredients determine the whole premium:

- **The stock's price.** The big one. As a stock rises, calls gain intrinsic value (or get closer to gaining it) and puts lose it. This is the only ingredient most beginners watch — and the source of the puzzle above.
- **The strike price.** A call with a lower strike is a better deal for the buyer, so it costs more. A $45 call on a $50 stock already holds $5 of intrinsic value; a $55 call on the same stock holds none, so it is cheaper — it is buying only possibility.
- **Time until expiration.** More time = more chances for the stock to move = more extrinsic value. A contract with three months left costs more than the same contract with three days left. This ingredient only ever moves in one direction: down, as the clock runs.
- **Volatility.** How much the stock's price swings around. A wild, jumpy stock can travel a long way before expiration, so its options cost more. A sleepy stock that barely moves has cheap options. This ingredient deserves its own section — see below.
- **Interest rates.** Higher interest rates slightly raise call prices and slightly lower put prices. For options expiring in days or weeks, the effect is tiny — most beginners can safely be aware of it and move on. (Its Greek, rho, appears at the end of this chapter.)

Everything in this chapter flows from these five. The Greeks are simply a way to measure, one ingredient at a time: *if this one thing changes, what happens to my option's price?*

Implied Volatility: The Market's Price Tag for Fear and Excitement

Volatility means how much a price swings. A stock that moves 3% on a normal day is more volatile than one that moves 0.3%.

Implied volatility (IV) is a percentage shown on every option chain. It is not a measurement of the past. It is the market's *expectation* of future swings, worked backward out of the option's price. Read it as a price tag: **IV is how much fear or excitement is currently baked into option prices.** When traders expect drama — an earnings report (a company's scheduled financial announcement), a court ruling, a big economic release — they bid options up, and IV rises. When calm returns, IV falls, and options get cheaper even if the stock never moved.

Two practical facts follow:

- **Same option, different IV, different price.** A call that costs $2.00 when IV is low might cost $3.50 when IV is high — same stock, same strike, same expiration. Buyers who purchase during high IV are paying a drama surcharge.
- **IV is about size of move, not direction.** High IV means the market expects a big swing *somewhere* — up or down. It does not tell you which way.

IV Crush: The Trap After Earnings

The most painful version of this lesson is called **IV crush**, and it strikes right after earnings.

Worked example. A stock trades at **$100**. Tonight it reports earnings, and traders expect a big reaction, so IV is very high. You buy a call with a **$100 strike** expiring in two days. Because of the expected drama, the premium is **$3.50** — all extrinsic value, since the strike equals the stock price.

The report is good. The stock rises to **$102**. You were right! Now look at your call:

- Intrinsic value: $102 − $100 = **$2.00**.
- Extrinsic value: the drama is over, IV has collapsed, and only two days remain — say **$0.30**.
- Your option is now worth about **$2.30**. You paid $3.50.

The stock rose $2 and you *lost* $1.20 per share — $120 per contract. The earnings move you paid for was smaller than the move the price had baked in, and the fear surcharge evaporated the moment the news landed.

> **RISK**
> Buying options right before earnings means paying the highest IV of the year for them. The stock must move *more than the market already expects* — not just in your direction — or IV crush can hand you a loss on a correct guess.

Meet the Greeks

The Greeks are five measurements, each named with a Greek letter, that describe how an option's price responds to one ingredient. Your broker's option chain shows them next to every contract. Think of them as the gauges on a car dashboard: you do not need to build the engine, but you must be able to read the speedometer and the fuel gauge before you drive.

Delta: The Speedometer

Delta measures how much an option's price changes when the stock moves $1.

- A call with a delta of **0.50** gains roughly **$0.50 per share** when the stock rises $1 — about **$50 per contract** — and loses roughly the same when the stock falls $1.

- A call with a delta of **0.20** moves only about $0.20 per $1 — slower, cheaper, and further from the action.
- Call deltas run from 0 to +1. Put deltas are negative: a put with a delta of **−0.40** *gains* about $0.40 per share when the stock *falls* $1.

Delta follows moneyness. Deep in-the-money calls have deltas near 1 — they move almost dollar-for-dollar with the stock. Far out-of-the-money calls have deltas near 0 — the stock can move and they barely respond. At-the-money calls sit near 0.50.

Delta also gives a rough probability hint: traders use it as a quick **approximation** of the chance an option expires in the money. A 0.30-delta call is often read as "about a 30% chance." Treat this as a ballpark, not an exact odds calculation — it is a shortcut, labeled honestly.

Theta: The Daily Rent

Theta measures how much value an option loses with the passing of **one day**, everything else unchanged. It is quoted as a negative number for buyers.

- An option with theta of **−0.05** loses about **$0.05 per share per day — $5 per contract, every day**, weekends included, whether the stock moves or not.

This is the rent a buyer pays for holding the contract, and the landlord always collects. Worse, the rent rises as the deadline approaches: an option might lose a few cents a day with two months left, then dimes a day in its final week. Theta decay **accelerates into expiration** — the melting ice cube from Part 1 melts fastest at the end. This is why an option can lose value on a day when "nothing happened." Something did happen: a day of your contract's life ended.

For the seller on the other side, theta is income — time passing pays them. That is the deep reason option selling exists.

Gamma: Delta's Change

Gamma measures how much **delta itself changes** when the stock moves $1.

- A call has delta 0.50 and gamma of **0.08**. The stock rises $1: delta becomes about 0.58, so the *next* $1 move is worth more than the last. The stock falls $1: delta drops to about 0.42, and the option slows down.

Gamma is the acceleration to delta's speed. It is largest for at-the-money options close to expiration — exactly where beginners like to trade cheap, short-dated contracts. There, delta can swing wildly on small stock moves, which is why options in their final days can gain 80% or lose 60% in an hour. Gamma is why expiration-week trading feels like a different, wilder game.

Vega: The Volatility Gauge

Vega measures how much an option's price changes when **implied volatility moves by 1 percentage point**.

- An option with vega of **0.12** gains about **$0.12 per share ($12 per contract)** if IV rises 1 point, and loses the same if IV falls 1 point — with the stock completely still.

Vega is IV crush, quantified: the earnings example above was vega taking money from the buyer when IV collapsed. Vega is biggest for options with lots of time left and strikes near the stock price. It shrinks toward zero at expiration, when there is no time left for expectations to matter.

Rho: The Small Print

Rho measures sensitivity to **interest rates**: how much the price changes if rates move 1 percentage point. For options expiring in days or weeks, rho is so small you can ignore it. It matters mainly for options expiring a year or more out, where higher rates modestly favor calls over puts. Know it exists; spend your attention on the other four.

The Five Greeks at a Glance

Greek	It measures...	Plain meaning for a buyer
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Delta	Price change per $1 stock move	Your speed — and a rough hint of your odds
Theta	Value lost per day	The rent you pay for holding the contract
Gamma	Change in delta per $1 stock move	How fast your speed itself is changing
Vega	Price change per 1-point move in IV	Your exposure to fear getting cheaper or pricier
Rho	Price change per 1-point move in interest rates	Mostly ignorable for short-term trades

How a Beginner Actually Uses the Greeks

You do not need all five, all the time. Two checks before every option purchase will prevent most beginner disasters:

Check delta — are you buying speed or a lottery ticket? A call with delta 0.60 participates in most of the stock's move: if the stock rises $2, your option gains roughly $1.20 per share. A call with delta 0.10 is a lottery ticket — the stock must move a *long* way before the option responds meaningfully. Neither is "wrong," but know which one you are holding, and do not pay real money for lottery-ticket expectations.

Check theta — what does one quiet day cost you? If theta is −0.09, every day the stock goes nowhere costs you $9 per contract. On a $150 option, that is 6% of your money per day, gone even if you are eventually right. Ask: *can my idea play out before the rent eats the position?* If the honest answer is no, buy more time (a later expiration) or do not take the trade.

Then combine them with the two lessons of this chapter. Before earnings, check IV: if it is sky-high, understand you are paying the drama surcharge and IV crush is waiting on the other side. And never forget that all extrinsic value — everything theta and vega are measuring — goes to exactly zero at expiration.

> **RULE**
> Do not hold cheap, far out-of-the-money options into expiration. They combine the worst of every Greek: tiny delta, brutal theta, and value that almost always finishes at zero. If you buy a short-dated option, plan your exit — a profit target and a sell-by date — before you enter.

Common Beginner Mistakes

- **Watching only the stock.** Your option answers to five ingredients, not one. A flat stock plus passing days is a losing option.
- **Buying before earnings without checking IV** — then meeting IV crush while being "right."
- **Ignoring theta on Friday.** Two weekend days of decay arrive in your account on Monday whether the market opened or not.
- **Buying 0.10-delta options as "cheap exposure."** Cheap because the market gives them roughly a one-in-ten ballpark chance — price and probability agree.
- **Holding a winning option into its final days** without a plan, while theta and gamma turn a calm trade violent.
- **Treating the Greeks as promises.** They are model estimates that update constantly — guides for thinking, not guarantees.

Chapter Summary

- An option's price is set by five ingredients: the stock's price, the strike, time left, volatility, and (barely) interest rates.
- **Implied volatility** is the market's expectation of future swings, expressed as a percentage and baked into prices — a price tag for fear and excitement.
- **IV crush**: after a big expected event like earnings, IV collapses, and options can lose value even when the stock moves the buyer's way.
- **Delta** is the speedometer: price change per $1 stock move, and a rough, ballpark hint of the odds of expiring in the money.
- **Theta** is the daily rent buyers pay; it is always negative for buyers and accelerates as expiration approaches.
- **Gamma** is delta's acceleration — biggest near expiration, which is why final-days options swing violently.
- **Vega** measures exposure to IV changes; **rho** measures interest-rate exposure and barely matters for short-term options.

Check Yourself

1. A call has a delta of 0.60. The stock rises $2. Roughly how much does the option gain per share, and per contract?
2. Your option has theta of −0.07. The stock does not move for three days. Roughly how much value does one contract lose?
3. Before earnings, IV is very high. The report is good and the stock rises — yet your call loses money. What happened?
4. An option has vega of 0.15. Implied volatility falls 3 points, and the stock is unchanged. What happens to the option's price, per contract?
5. Which Greek explains why options become wild and swing hugely in their final days before expiration?

Answers: 1) About 0.60 × $2 = $1.20 per share, or $120 per contract. 2) About 0.07 × 3 = $0.21 per share, or $21 per contract — lost to time alone. 3) IV crush: the pre-earnings premium carried a large fear surcharge; once the news landed, IV collapsed and the extrinsic value you paid for evaporated faster than the stock's rise could replace it. 4) It falls by about 0.15 × 3 = $0.45 per share, or $45 per contract — a pure vega loss with the stock sitting still. 5) Gamma: near expiration, delta changes extremely fast as the stock moves, so the option's speed — and price — whips around.

> **RULE**
> Before you buy, read two gauges out loud: delta (am I buying speed or a lottery ticket?) and theta (what does each quiet day cost me?). If you cannot answer both, the trade is not ready — and neither are you.