**KruegerAlgorithms**

*Foundations · market mechanics from the ground up*

# Dealer positioning: open interest, GEX, gamma flip and walls

Chapter 9 of 10

*Gamma exposure (GEX) estimates how much option dealers have to trade in the index after a price move and in which direction. This chapter explains open interest and volume, derives GEX per strike and in total, works through gamma flip, call wall and put wall on a small option chain, explains 0DTE, pinning, vanna and charm flows and names the assumptions on which each of these numbers depends.*

| Field | Value |
|---|---|
| Series | Futures, options and who makes the price |
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**In one sentence:** GEX is the calculation from chapter 8 for the whole market, that is, how many USD option dealers have to trade per 1 % price move, and it stands and falls with an assumption that cannot be checked from public data: who bought the options and who sold them.

**What this chapter is:** a derivation with a worked example. The option chain in the example is made up. Where our own measurements appear, they are marked and linked. What of this shows up in real prices is collected in chapter 10. **Not a trading recommendation.**

Chapter 8 showed what a single dealer with 100 options has to trade in the index. This one is about all dealers and all options together.

## 1. The question

From chapter 8 we know: a dealer with long gamma trades against the move and dampens it. A dealer with short gamma trades with it and amplifies it. If one knew for the whole market whether dealers together are long or short gamma, and by how much, one would know something about the character of the coming trading day.

Three things are needed for that: how many options are open, who holds which side of them, and how much gamma each option has. The first is public. The third can be computed (chapter 7). The second is the weak point.

## 2. Open interest and volume

**Volume** counts how many contracts were traded today. **Open interest** (OI) counts how many contracts are open at the end of the day. The two are easily confused. Four trades in the same option show the difference:

| Trade | Volume | Open interest afterwards |
|---|---|---|
| Anna buys 10 contracts new, Ben sells them new | 10 | 10 |
| Clara buys 5 new, David sells 5 new | 5 | 15 |
| Anna sells her 10 to Emil, who enters new | 10 | 15 |
| Clara and David close their 5 against each other | 5 | 10 |

The day's volume is 30. Open interest is 10. Open interest only rises when both sides enter new, and only falls when both exit. If a position merely changes owner, it stays the same.

Two properties are decisive for everything that follows:

- **Open interest comes once a day.** The clearing houses compute it after the close and publish it the next morning. During the trading day the number does not change, whatever happens.
- **Open interest knows no sides.** Every open contract has a buyer and a seller. The number does not say which of the two is a dealer.

## 3. Who has which side?

GEX needs an answer to the question that open interest does not answer. The usual answer is a rule of thumb about the behaviour of customers:

- **Customers buy puts** to protect portfolios (the pension fund from chapter 5). So dealers have **sold** these puts.
- **Customers sell calls** on their holdings to take in premium (the covered call from chapter 5). So dealers have **bought** these calls.

From this comes the standard assumption: **dealers are long calls and short puts.** By chapter 8 this means: from calls they have long gamma, from puts short gamma.

That is an assumption, not a finding. Customers also buy calls and also sell puts. On some days and at some strikes the rule holds, on others it does not. Data on who actually opened which side exists at the exchanges, but not for free and not in the usual GEX tools.

## 4. GEX derived

Chapter 8 derived how much a dealer has to trade after a move of 1 %, in USD of index notional, for $N$ contracts with multiplier $m$:

$$\text{Hedge flow per } 1\,\% = \Gamma \cdot S^2 \cdot 0.01 \cdot N \cdot m$$

**Step 1: per strike.** For every strike $K$ the open interest of the calls and of the puts is known. Call and put with the same strike and expiry have the same gamma $\Gamma_K$ (chapter 7). With the standard assumption calls count positive and puts negative:

$$\text{GEX}_K = \Gamma_K \cdot (\text{OI}_{\text{call}} - \text{OI}_{\text{put}}) \cdot m \cdot S^2 \cdot 0.01$$

**Step 2: the sum.** Over all strikes and expiries:

$$\text{GEX} = \sum_K \text{GEX}_K$$

**The unit** is USD per 1 % move. A GEX of +600 million USD means: if the index rises by 1 %, dealers by this calculation sell futures with a notional of 600 million USD. If it falls by 1 %, they buy that much. With negative GEX it is the other way round.

## 5. Worked example: a small option chain

The index is at 7,000. There is one expiry in 30 days, implied volatility is 16 % everywhere, the multiplier is 100 USD. Five strikes with made-up open interest:

| Strike | OI calls | OI puts | Calls minus puts | Gamma | GEX in million USD per 1 % |
|---|---|---|---|---|---|
| 6,800 | 5,000 | 30,000 | −25,000 | 0.00100 | −1,228 |
| 6,900 | 8,000 | 22,000 | −14,000 | 0.00117 | −805 |
| 7,000 | 20,000 | 20,000 | 0 | 0.00124 | 0 |
| 7,100 | 26,000 | 6,000 | +20,000 | 0.00119 | +1,169 |
| 7,200 | 32,000 | 3,000 | +29,000 | 0.00104 | +1,482 |
| Sum | | | | | **+618** |

The calculation for the 7,100 row:

$$0.001193 \times 20{,}000 \times 100 \times 7{,}000^2 \times 0.01 = 1.169 \text{ billion USD}$$

The picture is typical: below the price there are many puts, above it many calls. In total the dealers in this example are long gamma, with 618 million USD per 1 %. That corresponds to around 1,760 E-mini futures that would be sold after a rise of 1 % and bought after a fall of 1 %.

Two well-known levels can be read from the table:

- **Call wall:** the strike with the largest positive GEX. Here 7,200.
- **Put wall:** the strike with the largest negative GEX. Here 6,800.

## 6. The profile and the gamma flip

The sum of +618 million USD holds only at an index level of 7,000. Open interest stays the same, but the gamma of every option depends on the distance of the price from its strike (chapter 7). If the index falls, the puts at 6,800 and 6,900 move closer to the money and their gamma grows, while the calls at 7,100 and 7,200 move away. Recomputing the sum for every conceivable index level gives a profile:

| Index level | GEX in million USD per 1 % |
|---|---|
| 6,700 | −1,016 |
| 6,800 | −683 |
| 6,900 | −97 |
| 7,000 | +618 |
| 7,100 | +1,284 |
| 7,200 | +1,745 |

Between 6,900 and 7,000 the sign changes. The exact zero crossing is at 6,914. This point is called the **gamma flip**. The usual reading: above the flip dealers are long gamma and dampen moves, below it they are short gamma and amplify them.

In the example the flip is 86 points, that is 1.2 %, below the price. If the index falls to it, nothing has changed in the positions. All that has changed is which options are close to the money.

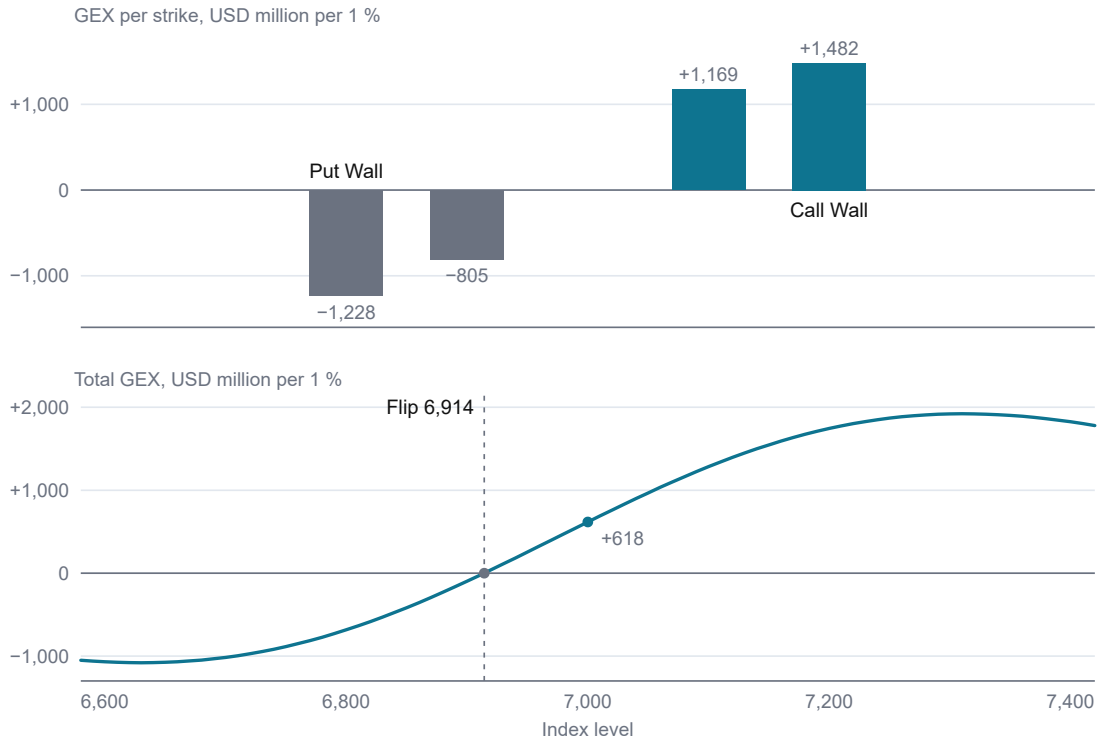



*Fig. 1: On top the GEX per strike at an index level of 7,000 with put wall (6,800) and call wall (7,200). Below it the sum for every index level between 6,600 and 7,400. It crosses the zero line at the gamma flip at 6,914.*

## 7. What walls are supposed to mean

Call wall and put wall are often read as resistance and support. The reasoning from the mechanics:

- **At the call wall** dealers have, by the standard assumption, bought many calls. As the price approaches, their long gamma grows. They sell into the rise. That slows it.
- **At the put wall** they have sold many puts. As the price approaches, their short gamma grows. They sell into the fall. That accelerates it, until the price has left the level behind.

By this logic the call wall is a brake and the put wall rather a place where things speed up, not a support. Both are conclusions from a model. They are not orders in the order book. Whether prices actually behave differently at these levels we have not been able to measure, because a reliable history of open interest per strike is missing (chapter 10).

## 8. 0DTE: the gamma that is missing from open interest

Chapter 7 showed: gamma at the money grows towards expiry, with one day to expiry to 5.5 times the value at 30 days. Options that expire today (0DTE) have the largest gamma of all in the afternoon.

Two problems follow for every GEX calculation:

- **Today's positions are in no open interest.** An option bought in the morning and expired in the evening was never part of the number published the next morning. Precisely the part with the largest gamma is invisible in the data.
- **The nearest expiry drowns out all the others.** If all terms are thrown into one sum, the shortest ones determine the result because their gamma is largest. These options no longer exist in the evening.

We observed the second problem on our own tool. On 10 June 2026 the call wall in the Nasdaq 100 jumped in the course of the day, with unchanged method and unchanged open interest, from 29,091 to 30,390, that is by around 1,300 points. Nobody had repositioned. The market had moved away from the strikes of the day's expiry, their gamma collapsed, and the weight tipped to more distant expiries (to the study). A map that mixes all terms measures different things in the morning and in the afternoon.

## 9. Expiry and pinning

**Pinning** is the idea that on expiry day the price "sticks" to a strike with a lot of open interest. The mechanics behind it: if dealers are long gamma at that strike, they sell above it and buy below it. Shortly before expiry gamma there is very large, and the trading correspondingly strong. It pushes the price towards the strike from both sides.

This again presupposes that dealers are long gamma there. If they are short gamma, the same mechanics work in the opposite direction and drive the price away from the strike.

We measured it like this: is the closing price on expiry days closer to round strikes than on other Fridays? In the S&P 500, Nasdaq 100, Dow and DAX the distance was the same (t 0.57, in the DAX −1.23). In index prices pinning was not visible to us (to the study).

## 10. Vanna and charm flows

Gamma describes what dealers have to trade after a **price move**. Chapter 7 showed two further reasons why their delta shifts without the price moving: a change in implied volatility (vanna) and the passing of time (charm).

Both act the same way on options out of the money: **falling volatility and passing time make their delta shrink.** What this means for the dealer, with the standard assumption:

| Dealer's position | His hedge | The option's delta shrinks | He has to |
|---|---|---|---|
| Out-of-the-money puts sold | futures sold | he needs fewer futures sold | buy futures back |
| Out-of-the-money calls bought | futures sold | he needs fewer futures sold | buy futures back |

In both cases dealers buy. Two widespread narratives arise from this:

- **Vanna rally:** in a quiet, rising market implied volatility falls. Dealers buy futures back, that supports the market, volatility falls further.
- **Charm into expiry:** in the days before a large expiry the delta of out-of-the-money options melts fastest. Dealers buy futures back, even without a price move.

The flip side: if volatility suddenly rises, the same thing runs backwards. The deltas of the out-of-the-money puts grow, dealers have to sell futures, and that in a falling market.

Both flows depend on the same assumption as GEX, and in addition on the skew from chapter 6. Our own measurement series on this is too short and was distorted by data errors. A substitute test, the open above the previous day's high in expiry week, showed no selling pressure: the first hour there ran better on average, not worse (+6.3 against +1.5 basis points, to the study).

## 11. The assumptions everything depends on

Every GEX number, every flip and every wall is the result of a calculation with assumptions. The most important ones:

- **The sign.** Dealers are long calls and short puts. If that is not true for a strike, its GEX has the wrong sign. For the flip it is enough if the assumption is wrong for a few large positions.
- **The data vintage.** Open interest is from the previous evening. Everything opened today is missing, including almost all 0DTE trading. Whoever recomputes the map during the day computes with old positions and new prices. The levels then trail behind the price.
- **Which expiries count.** The result depends heavily on which terms are included. We measured this on our own tool: a calculation from the option book of the S&P 500 ETF with 7 to 45 days to expiry showed short gamma on 60 % of days over 42 trading days. A freely published reference that uses all expiries of the S&P 500 showed short gamma on not a single day in the same period.
- **The model.** Gamma comes from the Black-Scholes formula with the implied volatility per strike. With skew, the delta dealers really use deviates from it (chapter 7).
- **Data quality.** Freely available option chains contain gaps and placeholders. An earlier reconstruction of our own over 1,302 trading days was not related to the reference at all (rank correlation −0.01). The formula was right, the input data were not.
- **Behaviour.** Dealers hedge net, not every option individually, often only beyond a deviation and frequently with other options instead of futures (chapter 8). The real flow in the index is smaller than the formula.

A simple rule for dealing with GEX values follows: two providers that compute with different expiries, different chains or a different sign rule can show an opposite regime for the same day, and neither of them has miscalculated.

## Common misconception

> **Common misconception:** "GEX measures how dealers are positioned." GEX measures nothing. From yesterday's open interest, a formula and an assumption about buyers and sellers it computes an estimate. Only the clearing house knows the dealers' positions. A call wall is therefore not a wall of orders but a strike at which, by a model calculation, a particularly large amount would have to be hedged, if the assumption holds.

## What you should understand now

- Volume counts trades, open interest counts open contracts. Open interest appears once a day and does not say who is buyer and who is seller.
- GEX per strike is $\Gamma_K \cdot (\mathrm{OI}_{\mathrm{call}} - \mathrm{OI}_{\mathrm{put}}) \cdot m \cdot S^2 \cdot 0.01$, in USD per 1 % move. The sign rests on the assumption that dealers have bought calls and sold puts.
- The gamma flip is the index level at which the sum changes sign. Call wall and put wall are the strikes with the largest positive and negative contribution.
- Options with very short terms have the largest gamma and are missing from open interest. Which expiries are included can reverse the sign of the result.

- Vanna and charm shift the hedge even without a price move. By the standard assumption falling volatility and passing time lead to buying by dealers, rising volatility to selling.

## Limits of this account

- **Made-up chain.** Five strikes, one expiry, a uniform volatility. Real chains have hundreds of strikes, dozens of expiries and a skew.
- **One sign rule.** There are others, such as estimating the side from the price of each individual trade. That needs data not available here.
- **Own findings.** The comparison with the reference covers 42 trading days in a single market environment. The example of 10 June 2026 is a single day.
- **Not covered:** options on futures, options on individual shares and their effect on the index, and structured products whose hedging also arrives in the index.

**Continue with chapter 10:** what of all this survives a measurement.

*An explanation of market mechanics with worked examples. Not investment advice and not a trading recommendation. Trading futures and options involves the risk of loss up to and beyond the capital employed.*