KruegerAlgorithms

Foundations · market mechanics from the ground up

What can be measured: the mechanics against our own tests

Chapter 10 of 10

Nine chapters of mechanics, one chapter of measurement. What market makers, auctions, futures and option dealers have to do can be derived. Whether it arrives in the price and whether a rule earns from it is a different question. This chapter assigns our studies to the mechanisms: confirmed is what concerns the size of a move. For direction we found almost nothing.

Field	Value
Series	Futures, options and who makes the price
Scope	Chapter 10 of 10
Type	Explanation with worked examples, not a measurement
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Contents

1. Three stages that have to be kept apart 2
2. How we measure 2
3. The overview 3
4. What is confirmed 3
5. What remains mechanics 3
6. What failed as a signal 4
7. The pattern behind it 5
8. What can be done with it 5

Common misconception 5

What you should understand now 5

Limits of this account 6

In one sentence: Of the mechanics in this series, our measurements show what concerns the size of a move, that is, range, costs and fluctuation, and next to nothing that concerns its direction.

What this chapter is: a summary of our own measurements, not a new study. Every number comes from a linked study on this website. Data basis, sample and limits are in the studies themselves. **Not a trading recommendation.**

Chapters 1 to 9 explained what market participants have to do. This chapter asks what of that can be seen in prices.

1. Three stages that have to be kept apart

Between "dealers have to sell here" and "money can be made here" lie two steps that are often skipped.

- **Stage 1, the mechanics:** someone has to trade, and it can be derived in which direction. That was the content of chapters 2 to 9.
- **Stage 2, the effect:** this trading is measurable in the price, for example as a wider range or as a move in one direction.
- **Stage 3, the rule:** a trading rule fixed in advance earns from it, after costs, in data that was not used in the search.

A mechanism can be correct and still fail at stage 2, because the flow is too small or because others offset it. And a measurable effect can fail at stage 3, because it is smaller than trading costs or because it concerns only the size of a move and not its sign.

2. How we measure

Every rule is fixed before the data is evaluated. The search runs in one period, the check runs once in a second, untouched period (holdout). Results are after costs. The comparison is a random market: the same prices with random direction, that is, the same fluctuation and no information at all. And because among many tests some always look good by chance, a correction is applied across all tests together. The workflow is described here.

As of November 2026: 108 rules have been through an untouched holdout. Two passed.

3. The overview

Chapter	Statement from the mechanics	Effect visible in the price?	Does a rule earn from it?
2, 3	Market makers withdraw liquidity when it becomes dangerous for them	yes: spread at three to four times	no: direction afterwards like a coin toss
3	Index funds have to trade in the closing auction on rebalancing days	yes: auction window 1.2 to 1.7 times as wide	yes, in the FTSE 100: +11.5 basis points in the holdout
3	The published auction imbalance shows the direction	not usable	no
3	VWAP and TWAP are price levels	no: as in the random market	no
4	Stock indices rise mainly overnight	yes: +3.22 basis points per night	not with CFDs: financing eats it up
6	Implied volatility lies above realised	yes: 0.74 to 0.84	the band is not a price limit
8, 9	Little dealer gamma means wider days	yes, also in the holdout	no: no direction
9	Gamma flip and walls are price levels	not testable for us	not testable for us
9	On expiry day the price sticks to round strikes	no	not tested
9	Charm flows push or support before expiry	not in the substitute test	no

4. What is confirmed

Three findings survived the measurement. All three concern the size of a move or a flow with a known direction and a known time.

Dealer gamma and the width of the day. Chapter 8 predicts: if dealers are short gamma overall, their trading amplifies moves. On a freely published gamma series for the S&P 500 the range of the next US session in the lower gamma tercile was 0.25 typical daily ranges larger than in the upper one (t 6.5). In the one-off holdout from 2023 to June 2026 it was 0.20 (t 3.2). Moves there also reverted less. The finding holds at the same VIX level. There is no direction in it: two rules that followed the day's direction in the lower gamma tercile came in at −0.50 and −3.05 basis points per trade (to the study).

The volatility premium. Chapter 6 says: the option price contains a mark-up. For 2015 to 2022 the fluctuation of the preceding 20 days was in the median 0.76 (S&P 500), 0.84 (Nasdaq 100) and 0.74 (Dow) of the implied volatility. The priced-in daily range held the closing price on 80.1 % of days; with a normal distribution and no mark-up it would be 68.3 % (to the study).

Forced trading in the closing auction. Chapter 3 says: index funds trade changes to the index in the closing auction before the effective date. The range in the auction window was 1.2 to 1.7 times as wide on rebalancing days as on comparison days in all eight markets examined. In the FTSE 100 a rule held as well: sell in the last hour of trading, buy back after the auction price. In the holdout from 2023 to 2026 that brought +11.5 basis points per rebalancing day (t 3.9, 22 of 27 days positive). It is one of the two patterns that passed our joint correction, and it is small: 27 days, around eight opportunities a year (to the study).

5. What remains mechanics

For the core of chapter 9 we have no measurement that would carry the verdict.

Gamma flip, call wall, put wall. To check whether prices behave differently at these levels, one needs the open interest per strike for many years, day by day. We do not have that data. Only the current state is freely available.

Our own attempt to reconstruct the series failed, and that belongs here. Over 1,302 trading days our reconstructed gamma series was not related to the published reference (rank correlation −0.01). It showed short gamma on 99 % of days, the reference on 12 %. The formula was the same as in chapter 9. What was wrong were the input data and the selection of expiries. We discarded all evaluations we had previously made on that series (to the study).

The lesson from it is more general than our mistake: a GEX number is as good as its option chain and its assumptions. Before attributing an effect to a level, one has to know whether the calculation behind it is right at all.

0DTE, vanna and charm. The mechanics are coherent (chapters 7 and 9). They can only be measured with data on who opened which option when. Our own charm series is too short and was distorted by the same data errors. The only substitute test went against the widespread narrative: in expiry week the first hour after an open above the previous day's high ran better on average, not worse (+6.3 against +1.5 basis points, to the study).

Pinning. On expiry day the closing price in the S&P 500, Nasdaq 100, Dow and DAX was no closer to round strikes than on other Fridays (t 0.57, in the DAX −1.23). That does not refute pinning in individual shares, where it is described in the literature. In the index it was not visible to us (to the study).

6. What failed as a signal

- **The spread jump as a directional signal.** On gold ticks (April 2023 to December 2024) the spread jumped to more than three times its usual value 2.5 times a day on average outside scheduled releases. Whoever then followed the move or traded against it was at zero before costs (−0.07 basis points, t −0.26). The signal indicates costs, not direction (to the study). The order book of the ES future shows the same: after losses, market makers pull depth (t −4.4 over 40 days), and after 817 one-sided flow bursts the direction is a coin toss (to the study).
- **The auction imbalance.** Whoever followed the published imbalance of the closing auction in the S&P 500 ETF lost 3.86 basis points per trade after costs (t −3.6, to the study). The sum over 20 heavyweights of the Nasdaq 100 passed in the search period with +3.15 basis points (t 2.6) and came in at −0.15 in the holdout (to the study).
- **VWAP and TWAP as a level.** 17,858 touches of the TWAP in the Nasdaq 100, S&P 500 and DAX: on the first, second and third touch the line was broken in 52 %, 49 % and 50 % of cases, in the random market in 54 %, 49 % and 52 % (to the study). Rules with VWAP bands earned nothing after costs (to the study).
- **The expected move as a limit.** After the first touch of the band the price first ran back in 38.5 % of cases, in the random market in 42.9 %. All 15 rules against the band lost after costs (to the study).
- **The overnight return with CFDs.** From 2000 to 2018 the return of the US indices arose almost entirely overnight (+3.22 basis points per night, t 4.13). With a CFD nothing of it is left after spread and financing (to the study).
- **Further forced flows.** Pension funds at month-end, trend followers and leveraged ETFs: several visible, none tradable (to the study). Volatility-targeting funds: no effect (to the study).

7. The pattern behind it

Putting the confirmed and the failed findings side by side shows a regularity.

Forced trading changes the size of moves, not their sign. A dealer with short gamma sells into falling and buys into rising prices. He makes the day wider. In which direction is decided by the first impulse, and the mechanics do not know that. A market maker who withdraws his orders makes the next order more expensive, in both directions.

There is a direction only if the flow itself has one and comes at a known time. That is the case on index rebalancing days: shares leaving the index are sold, in the closing auction, on a date fixed weeks in advance. That is exactly where we have our only finding from this subject area.

Small effects lose against costs. Most visible effects are a few basis points. Spread and financing cost just as much. What would be a rule before costs is none after costs.

8. What can be done with it

No signal follows from what is confirmed. Three sober uses follow:

- **The expected width of the day.** Implied volatility and dealer gamma say something about how large the coming move is likely to be. Stop distance and position size can be aligned with that. Whether this earns more after costs we have not tested.
- **Avoiding costs.** Around data releases a market order costs a multiple. In our measurement the spread normalised within seconds to less than a minute. Waiting is cheaper there than trading.
- **Putting levels in their place.** A gamma flip, a call wall or a VWAP are results of calculations. They describe where something could happen if the assumptions hold. As the sole reason for a trade they did not carry in any of our tests.

Common misconception

Common misconception: "Whoever understands the mechanics has an edge in trading." Understanding the mechanics protects against wrong conclusions: against the call wall as resistance, against the future as a forecast, against short gamma as a signal to the downside. An edge only arises from it when a rule earns after costs in unseen data. Of 108 rules we have tested in this way, two managed that, and only one of them comes from the subject area of this series.

What you should understand now

- Between a correct mechanism and a rule that earns lie two stages: the measurable effect in the price and the test after costs in unseen data.
- Three things are confirmed for us: little dealer gamma goes with wider days, implied volatility lies above realised, and on index rebalancing days forced trading arrives in the closing auction.
- We could not test gamma flip and walls as price levels because the history of open interest is missing. Our own reconstructed series was unusable.
- What failed as a signal: the spread jump, the auction imbalance, VWAP and TWAP as a level, the expected move as a limit and the overnight return with CFDs.

- Forced trading changes the size of moves. It delivers a direction only if the flow itself has one and comes at a known time.

Limits of this account

- **Data basis.** Almost all tests use index CFDs on minute data, not futures. We have evaluated an order book once so far: the ES future on 40 days, order by order (to the study). The gamma series comes from a single provider whose calculation is not fully published.
- **What is missing.** No test with open interest per strike, none with data on who opened options, none with positions from the current day's trading. The central claims of chapter 9 thus remain untested, not refuted.
- **Periods.** The search periods mostly end in 2022, the holdouts run to 2026. A finding over four years is not a law of nature.
- **No disproof for other markets.** That we did not find something in the index says nothing about individual shares or other asset classes.

Back to the overview of the series.

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.