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# Kurtosis Surge Momentum

Expert Advisor Documentation

| PLATFORM | TYPE | TIMEFRAME | WEBSITE |
| --- | --- | --- | --- |
| MetaTrader 5 (MT5) | Momentum Continuation | Intraday (M15–H1) | www.algobot.live |

> ⚠ **Important Disclaimer** This document is for educational and informational purposes only. It does not constitute financial or investment advice. Trading forex, CFDs, and other leveraged instruments involves substantial risk of loss and is not suitable for all investors. Past backtest performance does not guarantee future results. Never trade with capital you cannot afford to lose.

## Overview

**Kurtosis Surge Momentum** is a statistical momentum-continuation Expert Advisor built on two well-documented properties of financial returns: *fat tails* (leptokurtosis) and *volatility clustering* — the empirical observation that large moves tend to be followed by large moves. Rather than reacting to a single price pattern, the EA first asks whether the market is in a regime where impulsive moves are likely to *extend* instead of mean-revert, and only then acts on a genuine outlier move.

Over a rolling window of close-to-close log returns, the strategy measures the **excess kurtosis** of the return distribution. A high value flags a fat-tailed regime where the market has been producing outsized, impulsive candles. Within that regime it waits for a true "tail event": the return of the bar that just completed must be a statistical outlier, its **Z-score** exceeding a configurable threshold. It then trades in the *direction* of the surge, but only when a short trend EMA is sloping the same way, so it rides an impulse rather than fighting a fading one.

Risk is entirely volatility-adaptive. The stop-loss and take-profit are sized as multiples of the **Average True Range (ATR)**, so the trade bracket automatically scales with the very volatility that produced the surge. The EA runs on a single timeframe — whatever chart it is attached to — and is best suited to liquid, momentum-prone markets such as major FX pairs and indices on intraday timeframes where volatility clustering is pronounced.

> **Core idea in one sentence:** when the recent return distribution is fat-tailed *and* the latest completed bar is a directional outlier *and* a short EMA agrees with that direction, enter with the surge and let an ATR-scaled bracket manage the exit.

## How It Works

On every tick the EA checks whether a new bar has just formed. All analysis is performed once per completed bar, on the single timeframe the EA is attached to.

### 1. Measure the regime — excess kurtosis

Across the most recent `ReturnLookback` bars, the EA computes close-to-close log returns and their mean, second moment (variance) and fourth moment. From these it derives the **excess kurtosis**:

```
excessKurt = ( m4 / (m2 * m2) ) - 3.0
```

A value of zero corresponds to a Gaussian distribution. A value at or above `KurtThreshold` signals a fat-tailed regime — the environment in which a fresh impulse is most likely to continue.

### 2. Detect the surge — Z-score outlier

The return of the bar that just completed is standardised against the window statistics:

```
zLatest = ( latestReturn - mean ) / std
```

A surge is confirmed when the magnitude of this Z-score reaches `ZThreshold`. A positive extreme signals an upside tail event; a negative extreme signals a downside one.

### 3. Confirm direction — EMA slope

A trend EMA of period `EmaTrendPeriod` is maintained bar-by-bar. Its slope (current EMA minus previous EMA) must agree with the direction of the surge. This filter keeps the EA riding impulses that align with short-term drift and avoids fading a move that is already reversing.

### 4. Entry rules

The long and short conditions are distinct and fully symmetric:

- **Long:** `excessKurt ≥ KurtThreshold` AND `zLatest ≥ +ZThreshold` AND `emaSlope > 0`
- **Short:** `excessKurt ≥ KurtThreshold` AND `zLatest ≤ -ZThreshold` AND `emaSlope < 0`

A long is submitted at the Ask, a short at the Bid, using a fixed lot size of `Lots`.

### 5. Exit — ATR-based bracket

Every position carries a hard stop-loss and take-profit set at trade time. Distances are multiples of ATR (period `AtrPeriod`):

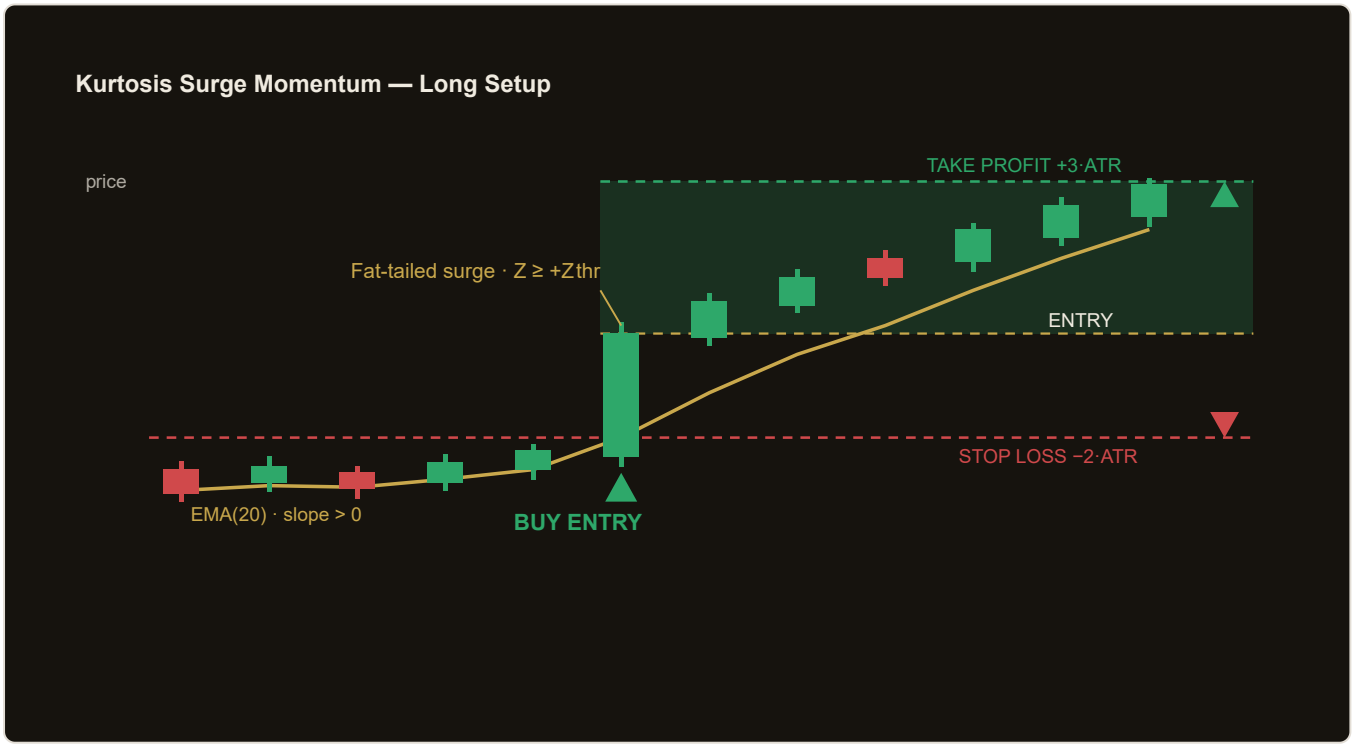
```
Stop Loss   = entry ± AtrSlMult * ATR
Take Profit = entry ± AtrTpMult * ATR
```

With the defaults (SL = 2×ATR, TP = 3×ATR) this yields an approximate 1:1.5 risk-to-reward bracket that widens in volatile conditions and tightens in calm ones. There is no trailing stop — the fixed bracket handles the entire exit.

> **One position at a time:** the EA holds at most a single open position per magic number. While a trade is live, no new signals are taken; the SL/TP fully determine the exit before the next setup can be considered.

## Strategy in Action

The illustration below shows an example of how the strategy identifies a setup and triggers its entry and exit. This is a simplified, illustrative example for educational purposes — not real market data.




*Illustrative example only. Actual market behaviour varies.*

## Parameters

| Parameter | Default | Description |
|---|---|---|
| **ReturnLookback** | `40` | Rolling window of close-to-close returns used for kurtosis, mean, standard deviation and Z-score. Range 20–100, step 5. |
| **ZThreshold** | `1.6` | How extreme (in standard deviations) the latest completed return must be to count as a surge. Range 0.8–3.0, step 0.1. |
| **KurtThreshold** | `1.0` | Minimum excess kurtosis of the window; gates entries to a fat-tailed regime. Range −1.0–6.0, step 0.5. |
| **EmaTrendPeriod** | `20` | Period of the trend EMA whose slope must agree with the surge direction. Range 5–60, step 5. |
| **AtrPeriod** | `14` | ATR period used to size the stop-loss and take-profit bracket. Range 5–30, step 1. |
| **AtrSlMult** | `2.0` | Stop-loss distance as a multiple of ATR (Stop = AtrSlMult × ATR). Range 0.5–5.0, step 0.5. |
| **AtrTpMult** | `3.0` | Take-profit distance as a multiple of ATR (Target = AtrTpMult × ATR). Range 0.5–8.0, step 0.5. |
| **Lots** | `0.10` | Fixed trade volume in lots. Range 0.01–1.0, step 0.05. |
| **Magic** | `5203` | Magic number identifying this EA's positions; enforces one open position per instance. |

## Recommended Settings

The defaults are a balanced starting point for liquid, momentum-prone instruments. Because every threshold interacts with the character of the traded market, always validate on your broker's data before committing capital.

### INSTRUMENTS & TIMEFRAMES

- **Markets:** major FX pairs (e.g. EUR/USD, GBP/USD, USD/JPY) and liquid indices where volatility clustering is pronounced.
- **Timeframes:** intraday charts such as M15 to H1, where fat-tailed impulses are frequent enough to generate setups.

TUNING GUIDANCE

- **ZThreshold** — raise it (e.g. 2.0–2.4) for fewer, higher-conviction surges; lower it (e.g. 1.2) for more frequent, noisier signals.
- **KurtThreshold** — increase to demand a more strongly fat-tailed regime; setting it near or below zero admits near-Gaussian conditions and greatly increases trade count.
- **AtrSlMult / AtrTpMult** — keep TP > SL for a favourable reward profile; widen both in choppy markets to avoid premature stop-outs.

**Example — conservative intraday configuration**

ReturnLookback = 50, ZThreshold = 2.0, KurtThreshold = 1.5, EmaTrendPeriod = 20, AtrPeriod = 14, AtrSlMult = 2.0, AtrTpMult = 3.5, Lots = 0.10. This demands a clearly fat-tailed regime and a strong outlier before entering, trading less often but with a wider profit target relative to risk.

**Tip:** optimise on a walk-forward basis. Kurtosis and Z-score thresholds that fit one market regime can over-fit; confirm that a chosen set of parameters remains profitable on out-of-sample data before going live.

## How to Install on MetaTrader 5

1. Copy `KurtosisSurgeMomentum.ex5` to your MT5 `MQL5\Experts\` folder
2. Restart MetaTrader 5 and refresh the Navigator panel
3. Drag the EA onto a chart matching the recommended symbol and timeframe
4. Configure the input parameters and click **OK**
5. Enable **Algo Trading** in the MT5 toolbar

## Risk Warning

Trading foreign exchange, CFDs, and other leveraged financial instruments involves substantial risk of loss and is not suitable for all investors. The strategies and tools described in this document are provided for **educational purposes only** and do not constitute financial advice, investment recommendations, or solicitation to trade. Always consult a qualified financial adviser before making trading decisions. Past backtest performance is not indicative of future results.