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Quadratic Trend Acceleration

Expert Advisor Documentation

PLATFORM	TYPE	TIMEFRAME	WEBSITE
MetaTrader 5 (MT5)	Trend Ignition (Acceleration)	H1 (works M15–H4)	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

Quadratic Trend Acceleration is a trend-ignition Expert Advisor built on a genuine second-order (quadratic) least-squares regression of price, rather than the usual straight-line fit. A linear regression answers a single question — *which way is price leaning?* (its velocity). It is completely blind to whether that lean is *strengthening* or *fading*. Quadratic Trend Acceleration adds the missing dimension by fitting a parabola to recent closes and reading its curvature: the market's *acceleration*.

On every freshly closed bar the EA fits the curve `y = a·x² + b·x + c` to the last `RegPeriod` closes and extracts two analytic quantities directly from the fitted coefficients:

- **Curvature (acceleration)** = `2a` — the constant second derivative of the fit, i.e. how quickly the trend is bending.
- **Endpoint slope (velocity)** = `2a·h + b` — the first derivative evaluated at the *newest* bar (x = h), where `h = (RegPeriod−1)/2` is the half-span of the window.

Both readings are normalized by ATR so that a single set of thresholds behaves consistently across symbols and timeframes. The result is an entry that fires at the precise moment a drifting or ranging market *bends* into an accelerating trend — while ignoring flat chop (where curvature stays near zero) and decelerating late-trend moves (where curvature points against the prevailing velocity).

> **The core idea in one line:** velocity tells you the market is moving; *acceleration* tells you it is *about to move faster*. Quadratic Trend Acceleration trades the ignition of that acceleration, confirmed by agreeing velocity.

How It Works

1. Quadratic least-squares fit

Over the last `RegPeriod` closes, the x-axis is centered so that `Σx = Σx³ = 0`. This mathematical trick decouples the normal equations, letting the parabola's coefficients be solved cheaply and exactly on each bar:

```
det = Σx⁴·p − (Σx²)²
a   = (Σx²y·p − Σy·Σx²) / det     // quadratic coefficient  (curvature = 2a)
b   = Σxy / Σx²                          // linear coefficient  (slope at the center)
slopeEnd = 2·a·h + b                       // velocity at the newest bar
```

Here `p = RegPeriod` and `h = (p−1)/2`. The newest closed bar sits at `x = +h`, so `slopeEnd` is the instantaneous slope of the fitted curve right at the leading edge of the data.

2. Volatility-normalized readings

Raw coefficients scale with price and volatility, so they are divided by the current ATR to become scale-free scores:

```
AccelScore = (a · h²) / ATR     // "ATRs of bend" at the window edge
SlopeScore = slopeEnd / ATR      // velocity in "ATR per bar"
```

`AccelScore` measures how many ATRs the parabola bends away from a straight line at the edge of the window — a clean, symbol-agnostic measure of acceleration. `SlopeScore` expresses the endpoint velocity in ATRs per bar.

3. Entry — a fresh ignition, not a state

The EA does not enter simply because acceleration is high. It requires a **fresh cross** of the curvature band on the current bar, combined with agreeing velocity. Using the previous bar's stored `AccelScore`:

- **BUY** — curvature was inside the band last bar (`prevAccel < +MinAccel`), crosses up this bar (`AccelScore ≥ +MinAccel`), *and* endpoint velocity already agrees (`SlopeScore > +SlopeFloor`).
- **SELL** — curvature was inside the band last bar (`prevAccel > −MinAccel`), crosses down this bar (`AccelScore ≤ −MinAccel`), *and* endpoint velocity agrees (`SlopeScore < −SlopeFloor`).

The strategy is fully symmetric — the long and short conditions are exact mirror images. Requiring a fresh cross (rather than a sustained state) isolates the exact bar on which the trend ignites, and the velocity floor discards accelerations that are not yet pointing in a decisive direction.

> **Worked example (BUY)**
>
> On the prior bar, `AccelScore` = 0.18 (inside the ±0.30 band). Price bends sharply higher and this bar prints `AccelScore` = 0.41, freshly crossing +0.30. The endpoint velocity `SlopeScore` = 0.09, comfortably above the +0.02 floor. Both conditions align → a long position opens at the Ask with an ATR-based stop and target.

4. Exit — ATR stop/target or opposite ignition

Once in a trade, risk is managed by fixed ATR-multiple levels set at entry:

- **Stop loss** = entry − `SlAtrMult × ATR` (below for longs, above for shorts).
- **Take profit** = entry ± `TpAtrMult × ATR`.

While a position is open, an **opposite ignition** triggers an exit-and-reverse: the EA closes the current position first, then evaluates the new signal for a fresh entry on the same bar. If no opposite ignition occurs, the position simply rides its ATR stop or target. Only one position per symbol/magic is held at a time.

5. Execution hygiene

- Signals are evaluated **once per freshly closed bar** — the still-forming bar is ignored, so entries never repaint.
- A **spread filter** (`MaxSpreadPoints`) skips fills when the spread is wider than the configured limit; set it to 0 to disable.
- The EA requires enough closed history for both the regression window and the ATR before it will act.
- Everything runs on `ctx.PrimaryTimeframe` only — a single chart, a single timeframe.

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
RegPeriod	`20`	Number of closes fitted by the quadratic regression window. Range 8–60, step 2. Larger values smooth the curve and detect slower, more deliberate accelerations; smaller values react faster but are noisier.
MinAccel	`0.30`	Curvature ignition threshold, expressed in ATRs of bend. Range 0.05–2.0, step 0.05. `AccelScore` must freshly cross ±this value to fire. Raise it to demand a sharper bend (fewer, stronger signals); lower it for more frequent entries.
SlopeFloor	`0.02`	Minimum endpoint velocity (ATR per bar) required for the velocity to "agree" with the curvature. Range 0.0–0.30, step 0.01. Filters out accelerations that have not yet developed a decisive directional lean.
AtrPeriod	`14`	ATR lookback used to normalize both the acceleration and velocity scores and to size stops/targets. Range 7–30, step 1.
SlAtrMult	`2.0`	Stop-loss distance as a multiple of ATR. Range 1.0–4.0, step 0.5.
TpAtrMult	`3.0`	Take-profit distance as a multiple of ATR. Range 1.0–6.0, step 0.5. With the defaults this gives a 3:2 reward-to-risk ratio.
MaxSpreadPoints	`30`	Maximum allowed spread, in points, for a fill. Range 0–200, step 5. Set to 0 to disable the spread filter entirely.
Lots	`0.10`	Fixed trade volume in lots. Range 0.01–1.0, step 0.05.
Magic	`5127`	Magic number identifying this EA's positions, so it manages only its own trades on the symbol.

Recommended Settings

The defaults are a balanced starting point for liquid FX majors on the H1 timeframe. The strategy is designed to be volatility-adaptive, so the same thresholds transfer reasonably well across symbols — but always validate on your broker's data before going live.

TIMEFRAME & SYMBOLS

- **Primary timeframe:** H1 is the sweet spot — enough bars for a stable parabolic fit while still catching fresh ignitions. M15 to H4 also work well.
- **Symbols:** trending, liquid instruments such as major FX pairs (EURUSD, GBPUSD, USDJPY) or index CFDs. Avoid thin, erratically-spread symbols where the spread filter will reject most fills.

TUNING GUIDANCE

- **Too many marginal entries?** Raise `MinAccel` (e.g. 0.40–0.60) to demand a sharper bend, and/or raise `SlopeFloor` to require stronger confirming velocity.
- **Missing early ignitions?** Lower `MinAccel` toward 0.15–0.20 and consider a slightly shorter `RegPeriod` (e.g. 14–16) for faster reaction.
- **Choppy market whipsaws?** Lengthen `RegPeriod` (e.g. 26–32) to smooth the fit, and widen `SlAtrMult` so ATR noise does not stop you out prematurely.

> **Balanced H1 preset:** `RegPeriod = 20`, `MinAccel = 0.30`, `SlopeFloor = 0.02`, `AtrPeriod = 14`, `SlAtrMult = 2.0`, `TpAtrMult = 3.0`, `MaxSpreadPoints = 30`. Optimize `MinAccel` and `RegPeriod` first — they have the largest effect on trade frequency and quality.

> **Tip:** Because entries fire on the *fresh cross* of the curvature band, over-optimizing `MinAccel` to a single dataset can be fragile. Prefer a value that performs consistently across several symbols and date ranges rather than the single best backtest number.

How to Install on MetaTrader 5

1. Copy `QuadraticTrendAcceleration.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

> **Note:** The EA acts only on a freshly closed bar, so allow a full bar to elapse after attaching it before expecting any signal. Run it in the Strategy Tester across your target symbol and date range first to confirm behaviour and calibrate parameters.

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.