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Centroid Torque Expansion

Expert Advisor Documentation

PLATFORM	TYPE	TIMEFRAME	WEBSITE
MetaTrader 5 (MT5)	Momentum / Volatility Expansion	H1 (single timeframe)	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

Centroid Torque Expansion is a single-timeframe Expert Advisor that trades the *onset* of directional expansion legs — the moments when price begins to accelerate away from its own moving equilibrium. Rather than reacting to a crossover or an overbought reading, it measures a physically-motivated quantity called *torque* and enters only when that torque begins to grow beyond what the recent volatility regime considers normal.

The strategy defines a rolling centroid `μ` (an EMA "centre of gravity" for price) and, on each completed bar, computes the price's deviation from it, the bar-to-bar velocity, and their product. That product is the torque about the centroid. Because torque equals the time-derivative of the squared deviation, a positive value means the market is being driven away from equilibrium — a fresh directional leg — while a negative value means it is relaxing back toward balance.

Entries are triggered when a short smoothed torque signal crosses above a **self-adapting threshold** (a multiple of the rolling standard deviation of torque), so the sensitivity scales automatically with the current volatility regime. Risk is managed with ATR-based stops and targets, and exits are tied to the same physics that drove the entry: the position is closed as soon as the expansion stops growing or price recrosses the centroid.

> **Core idea in one line:** torque `τ = (Close − μ) × (Close − Close₋₁)` is the per-bar rate of change of deviation energy `E = ½ (Close − μ)²`. Positive torque = energy building = a directional expansion under way; negative torque = energy dissipating = the move is done.

How It Works

1. The moving equilibrium (centroid)

On every completed bar the EA updates an exponential moving average of the close, `μ`, over `CentroidPeriod` bars. This centroid is treated as the market's current equilibrium — the level price is pulled toward and pushes away from. The signed distance of price from the centroid is the **lever arm**:

```
r  = Close − μ            (deviation / lever arm)
dv = Close − Close₋₁      (velocity / force)
τ  = r × dv              (torque about the centroid)
```

2. Torque as deviation-energy flux

Because `d/dt[ ½ (Close − μ)² ] = (Close − μ) · dv = τ`, the sign of torque tells you directly whether the market's departure from equilibrium is *growing* or *shrinking*:

- **τ > 0** — deviation energy is growing; price is being driven away from equilibrium on whichever side it currently sits. A directional expansion leg is under way.
- **τ < 0** — deviation energy is decaying; price is relaxing back toward the centroid. The expansion is over.

3. Smoothing and the adaptive threshold

Raw torque is noisy, so the EA works with a short running mean `T = mean(τ, TorqueSmoothing)`. It then estimates the population standard deviation of torque over a longer window, `σ = std(τ, StatWindow)`, and forms a **self-adapting z-score threshold** `thr = ThresholdK × σ`. Because the threshold is a multiple of the recent torque dispersion, it automatically widens in volatile regimes and tightens in quiet ones — the trigger scales with the market rather than using a fixed constant.

4. Entry logic

A trade is only considered when the smoothed torque makes a **fresh cross above the threshold** — i.e. the previous bar's `T` was at or below `thr` and the current bar's `T` is above it. This isolates the *onset* of a new expansion leg rather than chasing one already in progress. Direction is then chosen by the geometry and confirmed by velocity:

- **Long** — when `r > 0` (price above the centroid) *and* `dv > 0` (current bar rising). Buy at Ask.

- **Short** — when `r < 0` (price below the centroid) *and* `dv < 0` (current bar falling). Sell at Bid.

Only one position is held at a time; while a position is open the EA does not stack additional entries.

5. Exit logic

Exits are derived from the same hypothesis that produced the entry, so the trade is closed the moment its rationale disappears:

- Close a **long** when `T ≤ 0` (torque stopped expanding) *or* `r < 0` (price recrossed below the centroid).
- Close a **short** when `T ≤ 0` *or* `r > 0` (price recrossed above the centroid).

6. Stops, targets and position sizing

Every trade is protected with volatility-scaled risk levels based on the Average True Range over `AtrPeriod` bars:

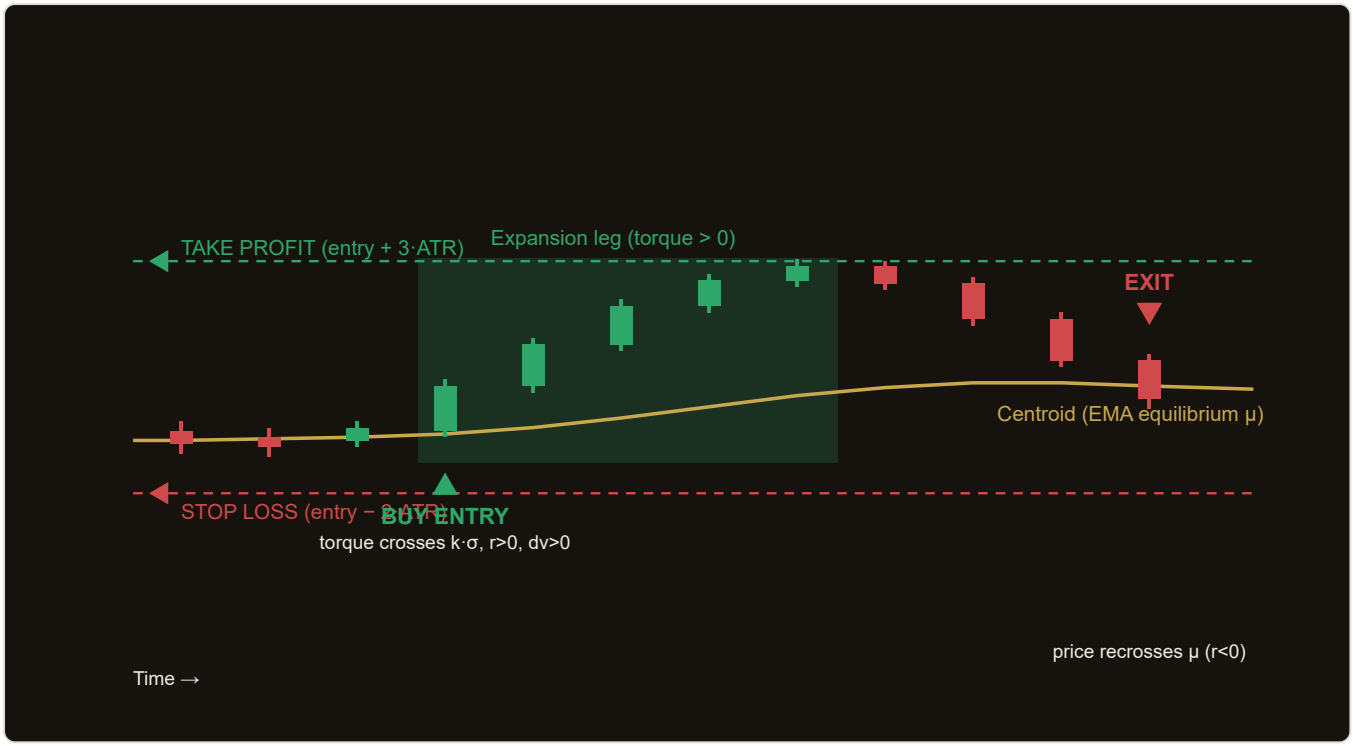
- **Stop loss** = entry ∓ `AtrStopMult × ATR`
- **Take profit** = entry ± `AtrTakeMult × ATR`

Positions are opened with a fixed `Lots` volume. The physics-based exit and the hard ATR stop/target run in parallel — whichever condition is met first ends the trade.

> **Worked example (long)**
>
> Suppose the centroid sits at 1.0850 and price closes at 1.0862 after a firm up-bar, so `r = +0.0012` and `dv = +0.0008`, giving `τ = +0.00000096`. As several such bars stack up, the smoothed torque `T` pushes above `thr = 1.20 × σ` for the first time in the window. With `r > 0` and `dv > 0`, the EA buys at the Ask, sets the stop `2.0 × ATR` below and the target `3.0 × ATR` above, and holds until either torque flattens (`T ≤ 0`), price falls back through the centroid, or the ATR stop/target is hit.

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
CentroidPeriod	`40`	EMA length of the moving equilibrium (centroid) that defines the lever arm `r`. Range 10–120, step 5. Larger = slower, smoother equilibrium.
TorqueSmoothing	`8`	Window `M` for the running smoothed torque `T = mean(τ, M)`. Range 2–30, step 1. Larger = fewer, cleaner signals.
StatWindow	`60`	Window `L` used to estimate the standard deviation of torque for the adaptive threshold. Range 20–200, step 10. Automatically clamped to be ≥ TorqueSmoothing.
ThresholdK	`1.20`	Self-adapting z-score multiplier; entry fires when `T` crosses above `k × σ(τ)`. Range 0.20–3.00, step 0.10. Higher = more selective.
AtrPeriod	`14`	Averaging period for the ATR used to size stops and targets. Range 5–40, step 1.
AtrStopMult	`2.00`	Stop-loss distance as a multiple of ATR. Range 0.50–5.00, step 0.25.
AtrTakeMult	`3.00`	Take-profit distance as a multiple of ATR. Range 0.50–8.00, step 0.25.
Lots	`0.10`	Fixed trade volume in lots. Range 0.01–1.00, step 0.05.
Magic	`20250710`	Magic number used to identify and manage this EA's own positions.

Recommended Settings

The defaults above are a balanced starting point on an intraday timeframe. Because the trigger is volatility-adaptive, the same parameters transfer reasonably well across instruments, but they should always be validated on your own broker's data before live use.

- **Symbols:** liquid, trending-capable pairs such as EUR/USD, GBP/USD, or USD/JPY, and index/metal CFDs that exhibit clean expansion legs.
- **Timeframe:** H1 is a sensible default. The EA is strictly single-timeframe — it uses the chart's own period for every calculation, so choose the chart timeframe deliberately.
- **Reward/risk:** the default `AtrTakeMult / AtrStopMult` gives a 1.5:1 target-to-stop ratio; widen `AtrTakeMult` for trend-following behaviour or tighten it for higher hit-rate scalps.
- **Selectivity:** raise `ThresholdK` (e.g. 1.6–2.0) to trade only the strongest expansion onsets; lower it for more frequent, earlier signals.

Tip: keep `StatWindow` comfortably larger than `TorqueSmoothing`. The EA needs a full `StatWindow` of torque history before it will trade, and a longer window produces a steadier adaptive threshold. If you set `StatWindow` below `TorqueSmoothing`, the EA raises it automatically.

Warm-up period: after attaching, the EA collects at least `CentroidPeriod + 1` closes and a full `StatWindow` of torque values before any entry can occur. On fresh charts or after a restart, expect no trades until enough bars have completed.

How to Install on MetaTrader 5

1. Copy `CentroidTorqueExpansion.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

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