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Damped Oscillator Regime Shift

Expert Advisor Documentation

PLATFORM	TYPE	TIMEFRAME	WEBSITE
MetaTrader 5 (MT5)	Adaptive Regime-Switching	Any (H1 recommended)	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

Damped Oscillator Regime Shift is a first-principles Expert Advisor that treats price not as a chart of patterns or smoothed indicators, but as the trajectory of a physical body governed by a discrete equation of motion — and then lets the data decide which physical regime the body is currently in.

The EA models the log-price as a one-dimensional mass moving under a *damped linear oscillator*. On every completed bar it re-measures the two coefficients that fully describe that motion by ordinary least squares (OLS), and the sign of one of those coefficients selects the trading regime. The result is a single system that fades displacement when the market behaves like a restoring spring, and rides displacement when the market behaves like a runaway explosion — without any indicator library, pattern catalogue, or fixed directional bias.

> **Core idea in one line:** the same distance from the centre produces *opposite* trades depending on the sign of the fitted stiffness, so the strategy is structurally incapable of fighting the regime it has just measured.

The Physical Model

The EA describes the log-price `p_t = ln(Close_t)` as a mass whose motion, over any short horizon, follows a damped linear oscillator on the discrete bar grid:

```
acceleration_t = A · displacement_(t-1) + B · velocity_(t-1) + e

  velocity_t     = p_t - p_(t-1)                first difference
  acceleration_t = p_t - 2·p_(t-1) + p_(t-2)    second difference
  displacement   = p_(t-1) - m       (m = mean of p over the window)
```

The two coefficients are not chosen by the trader — they are *measured* every bar by OLS over the last `Window` motion samples, and they fully characterise the local dynamics:

- **A — position feedback (stiffness).** `A < 0` is a genuine *restoring* force: the further price is pushed from its centre, the harder it is pulled back — a stable, mean-reverting regime. `A > 0` is an *anti-restoring / explosive* force: displacement feeds on itself and the body runs away from centre — a self-reinforcing, trending regime.
- **B — velocity feedback (damping).** `B < 0` damps motion, `B > 0` pumps it. It is used as a *conviction gate*, not as a directional signal.

Because `A` and `B` are re-estimated on every bar from raw OHLC alone, the system self-adapts as the market's effective spring constant flips. It is a regression-identified equation of motion, nothing more.

How It Works

1. Fit the equation of motion (every bar)

On each newly completed bar the EA builds `Window` regression samples from the log-close series and solves the two-variable normal equations for `A` and `B`. It also computes the centre `m` (mean) and spread `sigma` (standard deviation) of the level series, and standardises the current displacement:

```
d = (p_now - m) / sigma      standardised displacement (in std units)
```

2. Classify the regime

The fitted stiffness `A` must clear a dead-zone before the regime is considered decisive:

- **Restoring regime** — `A < -DeadZone`: a stable mean-reverting spring. *Fade* the displacement.
- **Explosive regime** — `A > +DeadZone`: a self-reinforcing trend. *Ride* the displacement.
- **Indecisive** — `|A| ≤ DeadZone`: no trade is armed.

3. Entry logic (symmetric long & short)

Given a decisive regime and a standardised displacement `d` beyond the `EntryBand` threshold:

Regime	Condition	Action
Restoring (fade)	`d ≤ −EntryBand`	LONG — stretched below centre, spring pulls up
Restoring (fade)	`d ≥ +EntryBand`	SHORT — stretched above centre, spring pulls down
Explosive (ride)	`d ≥ +EntryBand`	LONG — running up and away from centre
Explosive (ride)	`d ≤ −EntryBand`	SHORT — running down and away from centre

4. Damping (conviction) gate

A candidate entry is vetoed when the velocity feedback is actively working against the intended direction. Concretely, the trade is cancelled when `B · signal < -DeadZone` — that is, when the fitted damping is strongly pumping motion the other way. This keeps the EA out of dynamics that are actively killing the move it wants to take.

5. Exit logic

- **Regime flip.** If the freshly measured signal points against an open position, the trade is force-closed immediately — the fitted physics changing sign is itself an exit signal.
- **Chandelier ATR trailing stop.** The stop is trailed with live ATR and is only ever tightened: for longs, `Bid − AtrSlMult · ATR`; for shorts, `Ask + AtrSlMult · ATR`.
- **Fixed stop / target.** On entry the stop and target are placed at `AtrSlMult · ATR` and `AtrTpMult · ATR` from price, so they breathe with volatility.

> **One position per magic.** The EA never stacks trades. While a position is open it only manages that position (trail or regime-flip exit); it will not open a second trade until the first is closed.

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. It depicts a **restoring (fade) LONG**: price is stretched more than one standard deviation below its measured centre, the fitted stiffness is negative (a restoring spring), and the strategy fades the displacement, riding the snap-back toward and beyond the centre.

Illustrative example only. Actual market behaviour varies.

Parameters

Parameter	Default	Description
Window	`50`	Number of motion samples used to fit the equation of motion each bar. Range 20–150, step 5. Larger values give a slower, steadier estimate of the regime; smaller values react faster.
EntryBand	`1.0`	Standardised displacement (in std units) required to arm an entry. Range 0.3–2.5, step 0.1. Higher values wait for a more stretched move before trading.
DeadZone	`0.02`	Minimum |A| for the fitted regime to be considered decisive; also gates the damping veto. Range 0.0–0.20, step 0.01. Higher values demand a stronger, clearer regime before acting.
AtrPeriod	`14`	ATR length used for stop, target, and trailing distances. Range 7–30, step 1.
AtrSlMult	`2.0`	Stop-loss and trailing distance = AtrSlMult × ATR. Range 1.0–4.0, step 0.5.
AtrTpMult	`3.0`	Take-profit distance = AtrTpMult × ATR. Range 1.0–6.0, step 0.5.
Lots	`0.10`	Fixed position size in lots. Range 0.01–1.0, step 0.05.
Magic	`4207`	Magic number used to identify and manage this EA's positions. One position per magic is enforced.

> **Tip:** `EntryBand` and `DeadZone` together control trade frequency. Raising `EntryBand` demands a larger stretch from centre; raising `DeadZone` demands a more decisive regime. Loosen both for more signals, tighten both for fewer, higher-conviction trades.

Recommended Settings

The strategy runs on a single timeframe — whatever the chart is set to at attach time — because every price query uses the chart's primary timeframe. The defaults are a balanced starting point; the table below outlines sensible tuning directions.

Profile	Suggested adjustment	Effect
Balanced (default)	`Window 50, EntryBand 1.0, DeadZone 0.02`	Reference behaviour; trades both regimes with moderate frequency.
Conservative	`EntryBand 1.5–2.0, DeadZone 0.04–0.06`	Fewer, more stretched, higher-conviction entries.
Responsive	`Window 30–40, EntryBand 0.6–0.8`	Faster regime re-estimation and earlier entries; more trades and more noise.
Wider risk envelope	`AtrSlMult 2.5–3.0, AtrTpMult 4.0–5.0`	Roomier stops and targets that ride larger swings.

Example configuration — H1 major FX pair

Window = 50, EntryBand = 1.2, DeadZone = 0.03, AtrPeriod = 14, AtrSlMult = 2.0, AtrTpMult = 3.0, Lots = 0.10. Always validate any configuration in the Strategy Tester on your broker's data before considering live use.

> **Note:** the EA acts once per completed bar (new-bar detection), so signals are evaluated on bar close rather than intrabar. This makes backtests on real ticks and on the chart consistent, and keeps trade decisions from flickering within a forming candle.

How to Install on MetaTrader 5

1. Copy `DampedOscillatorRegimeShift.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.