

Distributional Separation Breakout

Expert Advisor Documentation

PLATFORM

MetaTrader 5 (MT5)

TYPE

Statistical Breakout

TIMEFRAME

H1 (recommended)

WEBSITE

www.algobot.live

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Overview

Distributional Separation Breakout is a breakout Expert Advisor built on the two-sample **Kolmogorov–Smirnov (KS) statistic**. Rather than reacting to a single extreme tick the way a classic Donchian or range breakout does, it asks a deeper statistical question: *have recent prices genuinely relocated to a new distribution, or are they still trading inside the same old range?*

The EA maintains two **adjacent, equal-length windows** of closing prices — a *recent* window (the last **N** closes) and a *prior* window (the **N** closes immediately before them). For each window it forms the empirical cumulative distribution function (CDF). The KS statistic **D** is the largest vertical gap between the two CDFs and always lies between 0 and 1:

$$D = \max_x |F_{\text{recent}}(x) - F_{\text{prior}}(x)| \quad (0 \leq D \leq 1)$$

- **$D \approx 0$** — the two windows are drawn from (nearly) the *same* price distribution. Price is oscillating inside one range: consolidation / balance.
- **$D \rightarrow 1$** — the two windows barely overlap. Recent prices have *decoupled* from the prior range: a genuine distributional regime change, i.e. a breakout.

Because the KS statistic compares the *whole shape* of both distributions via their maximum CDF separation, it only fires when the bulk of recent trading has genuinely moved — not on one spike. It is scale-free and needs no per-symbol tuning, which distinguishes it from the rank / location tests elsewhere in the library (Mann–Kendall, rank-sum, runs, Cox–Stuart).

Why direction still needs ATR. A high `D` tells you the distributions separated — but not *which way*. The EA reads direction from the sign of the **mean shift** between the two windows and requires that shift to clear a fraction of ATR. This blocks a pure *volatility-only* regime change (distributions widen but net drift is zero) from producing a directionless trade.

How It Works

Core Measurement

On every completed bar the EA appends the new close, rebuilds the two adjacent windows, and computes the KS statistic `D` between them. It also computes the **mean shift** (`mean(recent) - mean(prior)`) and the current **ATR** over `AtrPeriod` bars. All decisions are taken once per closed bar, never intrabar.

Entry Logic

A trade is armed only on a **fresh cross** of `D` up through the entry threshold — that is, the previous bar's `D` was below `KsEntry` and the current bar's `D` is at or above it. This "fresh separation" event marks a new regime just emerging out of balance. Direction is then set by the ATR-gated mean shift:

- **LONG** when `mean(recent) - mean(prior) ≥ +DirAtrFrac × ATR`
- **SHORT** when `mean(recent) - mean(prior) ≤ -DirAtrFrac × ATR`

If a fresh separation prints but the mean shift fails to clear `DirAtrFrac × ATR` in either direction, no trade is taken — the move is treated as a volatility-only event with no tradable direction.

Position Management & Exits

- **Reverse:** if a fresh separation prints in the *opposite* direction while a position is open, the current position is closed and the EA is free to open the new one.
- **Dissipation exit:** when `D` falls back below `KsExit`, the two distributions have re-merged — the breakout has decayed back into a range — and the position is closed.
- **Protective stop & target:** every position carries an ATR-based stop-loss and take-profit, sized by `SlAtrMult` and `TpAtrMult`, that manage the trade while it is held.

STOP-LOSS & TAKE-PROFIT

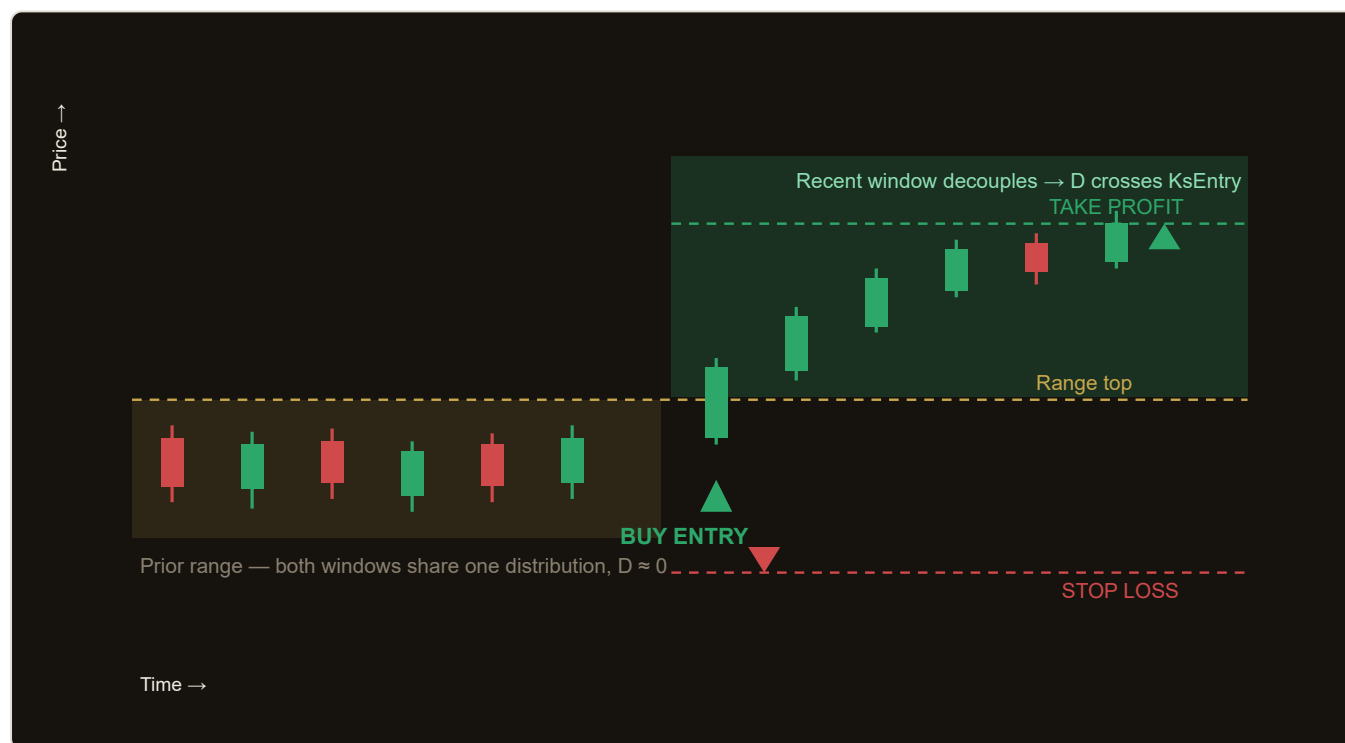
LONG	$SL = \text{entry} - SL_{\text{AttrMult}} \times ATR$	$TP = \text{entry} + TP_{\text{AttrMult}} \times ATR$
SHORT	$SL = \text{entry} + SL_{\text{AttrMult}} \times ATR$	$TP = \text{entry} - TP_{\text{AttrMult}} \times ATR$

With the defaults ($SL_{\text{AttrMult}} = 2.0$, $TP_{\text{AttrMult}} = 3.0$) this yields a 1.5 : 1 reward-to-risk geometry on the protective bracket.

Self-consistency guard. On initialisation the EA forces $KsExit$ to stay strictly below $KsEntry$. If a user sets $KsExit \geq KsEntry$, it is automatically clamped to $KsEntry \times 0.5$, so a trade can never open and instantly fail its own dissipation test.

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.

In the example, price first oscillates inside a single balance range — the recent and prior windows share the same distribution, so D stays low. When the market relocates above the range, the recent window's CDF pulls away from the prior window's, D crosses $KsEntry$, and the positive mean shift (clearing $Dir_{\text{AttrFrac}} \times ATR$) confirms a **long**. The ATR stop sits below and the ATR target above; the trade would also exit early if D collapsed back below $KsExit$.

Parameters

Parameter	Default	Description
SampleWindow	24	Window length N : the number of closes in each of the recent and prior windows (range 10–60, step 2). Larger values demand a broader, slower distributional shift.
KsEntry	0.60	KS statistic level that arms a fresh separation. A cross of D up through this value triggers a candidate entry (range 0.30–0.95, step 0.05).
KsExit	0.30	KS level below which the breakout is deemed re-merged, closing the position (range 0.00–0.70, step 0.05). Auto-clamped to stay below KsEntry .
DirAtrFrac	0.50	Minimum mean shift required, expressed as a fraction of ATR. Filters out volatility-only regime changes that lack a tradable direction (range 0.00–2.00, step 0.10).
AtrPeriod	14	Averaging period for the ATR used in the direction gate and the SL/TP distances (range 7–30, step 1).
SlAtrMult	2.0	Protective stop-loss distance, in multiples of ATR (range 1.0–4.0, step 0.5).
TpAtrMult	3.0	Take-profit distance, in multiples of ATR (range 1.0–6.0, step 0.5).
Lots	0.10	Fixed trade volume in lots (range 0.01–1.0, step 0.01). Rounded to 2 decimals; floored at 0.01.
Magic	5307	Magic number identifying this EA's positions, so it manages only its own trades.

Recommended Settings

The strategy is scale-free and needs no per-symbol tuning, but the following starting points give the statistic enough sample bars to be meaningful while keeping the breakout responsive.

Setting	Suggested	Notes
Symbol	Major FX pairs	Liquid instruments (e.g. EURUSD, GBPUSD, USDJPY) give clean, continuous distributions.
Timeframe	H1	Enough bars per session for the two windows without overreacting to microstructure noise.
SampleWindow	20–28	Balances distributional resolution against lag; 24 is a solid default.
KsEntry / KsExit	0.60 / 0.30	Demands a decisive separation to enter and a clear re-merge to exit.
DirAtrFrac	0.40–0.60	Raise it to reject more volatility-only, driftless separations.

Example configuration — EURUSD H1

```
SampleWindow=24, KsEntry=0.60, KsExit=0.30, DirAtrFrac=0.50, AtrPeriod=14, SIAtrMult=2.0,
TpAtrMult=3.0, Lots=0.10
```

This is the default profile: it waits for a broad distributional relocation ($D \geq 0.60$) confirmed by a mean shift of at least half an ATR, then rides it with a 2-ATR stop and a 3-ATR target, exiting early if the move dissolves back below $D = 0.30$.

Sizing tip. `Lots` is a fixed volume. Choose it so that the worst-case loss on a full $SIAtrMult \times ATR$ stop is a small, comfortable fraction of your account equity, and consider lowering it on more volatile symbols.

How to Install on MetaTrader 5

- 1 Copy `DistributionalSeparationBreakout.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 completed bars and needs at least $2 \times SampleWindow$ closes plus $AtrPeriod + 1$ bars of history before it can trade. Allow a warm-up period on a fresh chart.

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.