

Triangular Parity Arbitrage

Expert Advisor Documentation

PLATFORM

MetaTrader 5 (MT5)

TYPE

Statistical Arbitrage · Mean Reversion

TIMEFRAME

M1 – M15

WEBSITE

www.algotbot.live

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Overview

Triangular Parity Arbitrage is a statistical mean-reversion Expert Advisor for liquid FX *cross* pairs — pairs that do not contain the US dollar, such as EURGBP, EURJPY, GBPJPY, AUDNZD, EURCHF, and AUDJPY. It exploits a structural truth of the currency market: a cross rate is not an independent price. It is mechanically bound to its two US-dollar “legs” through the dollar itself.

For example, EURGBP must satisfy:

$$\text{EURGBP} == (\text{EUR in USD}) / (\text{GBP in USD}) == \text{EURUSD} / \text{GBPUSD}$$

More generally, for any cross **BASE/QUOTE** the fair **synthetic parity** price is the value of one unit of the base currency in USD divided by the value of one unit of the quote currency in USD:

$$\text{Synthetic} = \text{ValueInUSD}(\text{BASE}) / \text{ValueInUSD}(\text{QUOTE})$$

Because the cross and its two USD legs are quoted by independent order books, tiny latency and liquidity gaps push the actual cross away from this synthetic value. Those dislocations are transient — the triangle must re-close — so the mispricing mean-reverts. The EA trades **only the primary cross symbol**, but derives its signal from the whole triangle. It measures the relative gap between the actual cross and its synthetic

parity, standardises that gap into a rolling z-score, and fades extremes: selling a cross that is rich versus parity and buying one that is cheap, banking the trade as the triangle re-converges.

Requires the two USD legs. The strategy needs both dollar legs (e.g. EURUSD and GBPUSD for EURGBP) to be available to the engine. If the symbol is a USD major, is malformed, or a leg has no data, the EA safely stands aside and stays flat. In MT5 the two legs are automatically pulled into Market Watch on initialisation so their data loads.

How It Works

Building the synthetic parity price

On initialisation the EA splits the traded symbol (e.g. `EURGBP`, optionally with a broker suffix like `.r` or `m`) into its base and quote currencies and constructs the standard USD pair for each:

- Currencies quoted `xxx/USD` (EUR, GBP, AUD, NZD ...) use their USD pair **directly** — e.g. EURUSD.
- Currencies whose standard pair is `USD/xxx` (JPY, CHF, CAD, SEK, NOK, and other USD-base currencies) are **inverted** — the value of one unit is `1 / price` (e.g. USDJPY → `1 / USDJPY`).

The deviation and its z-score

On each newly-closed primary bar the EA reads the just-closed (shift 1) closes of the cross and both legs, computes each currency's value in USD, and forms the synthetic price. The relative mispricing is:

```
deviation = (ActualCross - Synthetic) / Synthetic
```

Each deviation is appended to a rolling, newest-last history. Over the most recent `Lookback` bars the EA computes the mean and standard deviation of the deviation and standardises the current reading:

```
z = (deviation - mean) / std
edge = deviation - mean          (signed mispricing vs. its own mean)
```

The z-score says *how extreme* the current dislocation is relative to its recent norm; the `edge` filter (in basis points, `MinEdgeBp / 10000`) guarantees the raw gap is bigger than typical noise before a trade is considered.

Entry logic

With no position open, and only if the cross spread is at or below `MaxSpreadPoints`, the EA fades the dislocation:

- **SHORT (sell cross)** — when `z ≥ +EntryZ` and `edge ≥ +MinEdge`. The cross is rich versus synthetic parity; sell it and expect it to fall back.

- **LONG (buy cross)** — when $z \leq -\text{EntryZ}$ and $\text{edge} \leq -\text{MinEdge}$. The cross is cheap versus synthetic parity; buy it and expect it to rise back.

The strategy never stacks positions on the same triangle — at most one position is held at a time.

Protective stops and targets

Position size is fixed at `Lots`. Stop-loss and take-profit distances are volatility-scaled by the Average True Range of the cross itself (period `AtrPeriod`):

```
stopDist = AtrStopMult × ATR
targetDist = AtrTargetMult × ATR
```

For a short, the stop sits above entry and the target below; for a long, the reverse. This protects every trade against a dislocation that keeps widening and banks profit when parity is restored.

Exit logic

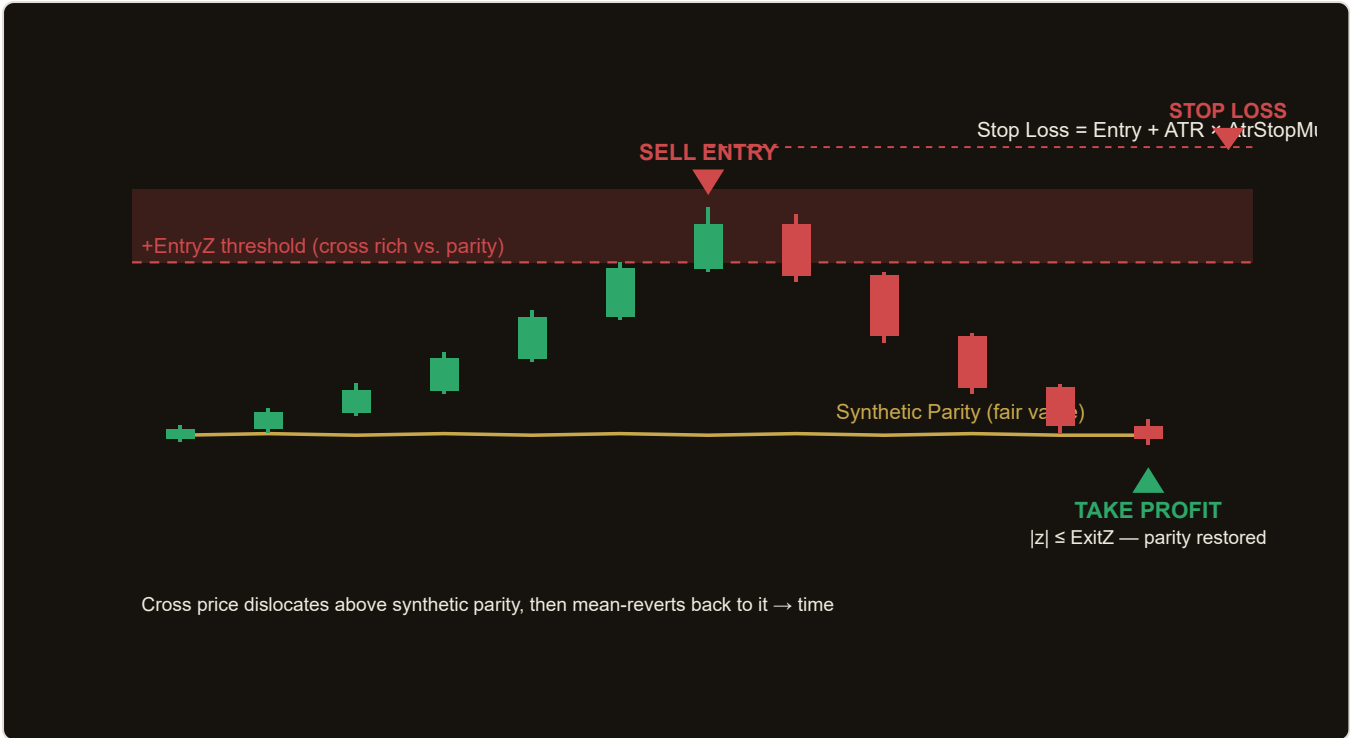
An open position is managed first, on every new bar:

- **Convergence exit** — close when $|z| \leq \text{ExitZ}$. The gap has collapsed back toward zero: parity is restored and the edge is gone.
- **Time stop** — close when the position has been held for at least `MaxHoldBars` bars (set `0` to disable). This refuses to marry a stuck dislocation.
- **ATR stop / target** — the broker-side SL/TP orders close the trade if price reaches either level first.

Not a risk-free arbitrage. Despite the name, this is a *statistical* reversion trade, not a locked three-leg arbitrage. Only the cross is traded; the legs are used purely to estimate fair value. A dislocation can widen well past `EntryZ` before it re-converges — or fail to converge at all — which is exactly why the ATR stop and the time stop exist.

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
Lookback	120	Rolling window (bars) used to compute the mean and standard deviation of the parity deviation for the z-score. Range 30–400, step 10.
EntryZ	2.0	z-score needed to open a fade of the mispricing. Higher = rarer, more extreme entries. Range 1.0–4.0, step 0.25.
ExitZ	0.5	Close the position once <code> z </code> falls back to this level (parity restored). Range 0.0–2.0, step 0.25.
MinEdgeBp	1.0	Minimum raw mispricing, in basis points beyond the rolling mean, required before a trade is taken. Filters out sub-noise gaps. Range 0.0–15.0, step 0.5.
AtrPeriod	14	Averaging period for the ATR used to size the stop and target. Range 5–40, step 1.
AtrStopMult	2.0	Protective stop distance as a multiple of ATR. Range 0.5–5.0, step 0.1.
AtrTargetMult	3.0	Profit-target distance as a multiple of ATR. Range 0.5–8.0, step 0.1.
MaxSpreadPoints	60	Skip new entries when the cross spread (in points) is wider than this, to avoid costly fills. Range 5–300, step 5.
MaxHoldBars	200	Hard time stop in bars (0 disables it). Prevents marrying a stuck dislocation. Range 0–2000, step 10.
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. Range 0–9,999,999, step 1.

Recommended Settings

The strategy is designed for **liquid non-USD crosses** whose two USD legs are deep and whose parity bond is tight. Suggested starting points:

- **Symbols:** EURGBP, EURJPY, GBPJPY, AUDNZD, EURCHF, AUDJPY, and similar major crosses. Ensure both USD legs are offered by your broker.
- **Timeframe:** M1 to M15. Lower timeframes surface more dislocations; higher timeframes filter noise. The EA uses whatever timeframe the chart is set to.
- **Entry / exit:** keep `EntryZ` around 2.0–2.5 and `ExitZ` around 0.3–0.7 for a classic fade-and-converge profile.

- **Edge filter:** raise `MinEdgeBp` on wider-spread crosses (e.g. GBPJPY) so trades only fire when the gap clearly beats transaction cost.
- **Spread guard:** set `MaxSpreadPoints` to sit just above your broker's typical spread on the chosen cross so entries are skipped during illiquid or news-driven widening.

Tip — always optimise on your own broker's data. Spreads, symbol suffixes, and leg availability differ between brokers. Run the MT5 Strategy Tester on the exact symbol and account you intend to trade, and confirm in the Experts log that the EA prints a valid triangle (e.g. `TPA triangle: EURGBP ~ (val EURUSD) / (val GBPUSD)`) rather than "standing aside."

Example — a EURGBP fade

Suppose EURUSD and GBPUSD imply a synthetic EURGBP of 0.85000, but the actual cross prints 0.85090 — roughly +10.6 bp rich. If that pushes the rolling z-score to +2.3 (above `EntryZ` 2.0) and the edge clears `MinEdgeBp`, the EA sells EURGBP with an ATR-based stop above and target below. When the triangle re-closes and `|z|` falls to 0.5 or less, the convergence exit banks the trade — or the ATR target/stop or time stop resolves it first.

How to Install on MetaTrader 5

- 1 Copy `TriangularParityArbitrage.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

Confirm the USD legs are loaded. The EA calls `SymbolSelect` to add both dollar legs to Market Watch on start-up, but if your broker hides a leg or uses an unusual suffix the triangle cannot be built. Check the Experts log after attaching the EA to verify the triangle line prints correctly.

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.