Dispersion Trading:

We are going to collect some notes on dispersion trading for future reference based on paragraph 4.3 from the following document: http://isomorphisms.sdf.org/maxdama.pdf

The volatility of a basket of random variables is:

$$\sigma_{basket}^2 = \sum_{i}^{N} w_i^2 \sigma_i^2 + \sum_{i}^{N} \sum_{j \neq i}^{N} w_i w_j \sigma_i \sigma_j \rho_{ij}$$

Data:

If the correlation of the components of a basket increases, then the volatility will too.

The price of an option is directly related to its volatility In particular, option value increases with volatility (vega > 0).

Correct Assumptions:

Correlation is mean-reverting so if it is low, it will likely go up, and if it is high it will likely go down.

Lower average correlation implies lower (basket) index variance, which in turn implies that an option on the basket gets cheaper.

Wrong Assumptions:

The volatility of the sum of the components of a basket are equal to the overall basket's volatility. Therefore the value of a basket of options should be equal to an option on the entire basket.

Why is this wrong: Linearity only holds for linear payoffs whereas options are nonlinear instruments.

Strategy:

Expect correlation ↑ → Buy index, **sell singles = short dispersion**.

Expect correlation ↓ → Sell index, **buy singles = long dispersion**.

Why sell singles though?

To hedge the position.

We need to also understand the following statement and specifically, what it means for the average market correlation to be unusually low **(compared to what ???)**

... So if the average market correlation is unusually low, then the price of a basket of options will likely decrease as the price of an option on the basket increases.

We need a reference distribution:

Pick SPY top 10, compute daily returns

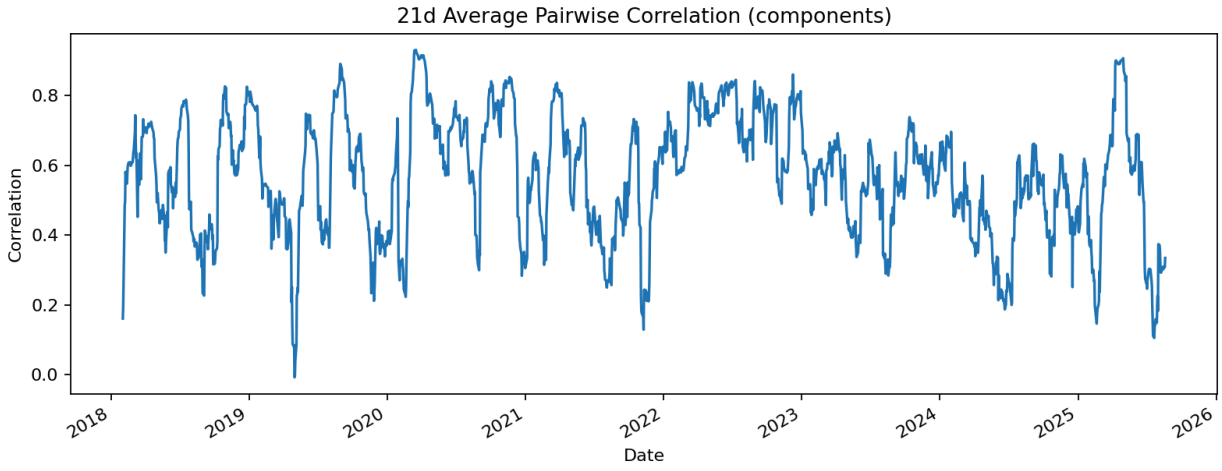
Compute a rolling window average pairwise correlation among components

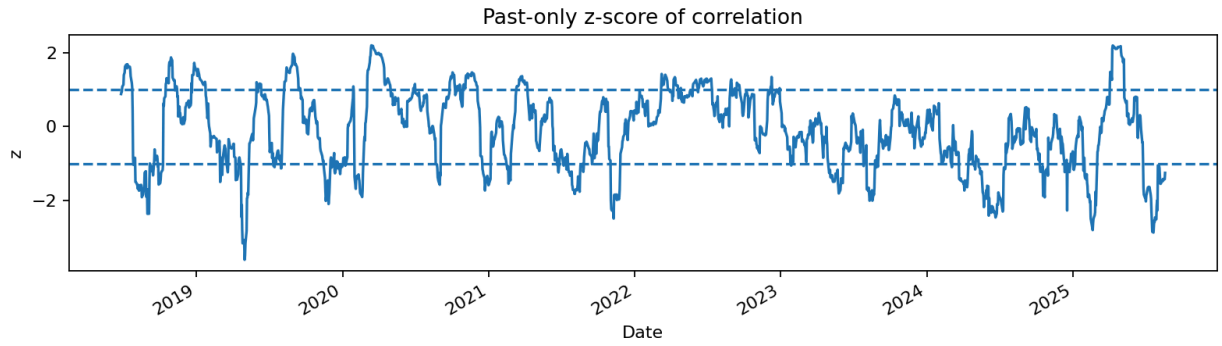
Convert today's value to a z-score. "**Unusually low** could mean **z < -1 (~ bottom 16%)**"

Or implied correlation baseline computed from options.

Data Sources:

- Prices: Daily adjusted closes from Yahoo Finance via yfinance (auto_adjust = True).
- Returns: Business day log returns from those adjusted prices.





Backtest: Signal Validity Test

We compute the 21-day average pairwise correlation among SPY components and convert it to a past only z-score (3-year look back). We label **z < - 1,** as “Unusually Low”, as discussed previously in this document and **z > 1** as “Unusually High”.

We then check whether realized correlation moved in the expected direction (mean - reversion) over the next ~21 trading days.

Limitations:

Free delayed data, signal validity test, no real P&L.

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>>
Date: 2025-08-19
21d avg pairwise corr: 0.335
z-score (past-only, 756d lookback): -1.26
Regime: LOW (expect corr ↑ → short-dispersion stance)
Saved: reports\realized_corr_snapshot_2025-08-19.csv
Saved figures: reports\fig_corr.png, reports\fig_zscore.png

Backtest (signal validity, no P&L)
  Frequency: W-FRI, forward horizon: 21 business days
  Trades: 130
  Hit rate: 85.38%
  Mean Δcorr on trades: 0.0534
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