

# Dispersion Trading in Practice: The “Dirty” Version

## From Textbook Correlation Trades to Execution-Driven Reality

Quant Insider

October 19, 2025

### Abstract

Everyone loves the textbook dispersion trade: short index vol, long single-stock vol, vega-neutral. Practitioners who actually make money run a “dirty” version that accounts for execution, funding, liquidity, and flow asymmetries.

## 1 Introduction

Textbook dispersion isolates the correlation embedded in index options by shorting index volatility and buying the component stock volatilities, sized so that first-order vega cancels. In practice, the trade is *dirty*: your realized outcome is driven by **execution friction, funding & margin, liquidity asymmetry**, and **flow-distorted surfaces**. The edge isn’t found in a tidy identity; it emerges when your infrastructure extracts correlation premia faster than costs erode it. *This is a flow business, not a backtest fantasy.*

## 2 Textbook (“Pure”) Dispersion

Consider an approximately equal-weighted index of  $N$  stocks with (log) returns  $\{r_i\}_{i=1}^N$ :

$$r_{\text{idx}} \equiv \frac{1}{N} \sum_{i=1}^N r_i, \quad \sigma_i^2 \equiv \text{Var}(r_i), \quad \bar{\sigma}^2 \equiv \frac{1}{N} \sum_{i=1}^N \sigma_i^2.$$

Assume homogeneous average pairwise correlation  $\rho$ . Then

$$\text{Var}(r_{\text{idx}}) = \frac{1}{N^2} \sum_{i=1}^N \sum_{j=1}^N \text{Cov}(r_i, r_j) = \frac{1}{N^2} \left( \sum_i \sigma_i^2 + \sum_{i \neq j} \rho \sigma_i \sigma_j \right). \quad (1)$$

If we further approximate  $\sigma_i \approx \bar{\sigma}$ , we obtain

$$\sigma_{\text{idx}}^2 \approx \frac{1}{N^2} \left( N \bar{\sigma}^2 + \rho \bar{\sigma}^2 N(N-1) \right) = \bar{\sigma}^2 \left( \rho + \frac{1-\rho}{N} \right). \quad (2)$$

For large  $N$ ,  $\sigma_{\text{idx}}^2 \approx \rho \bar{\sigma}^2 \Rightarrow \rho \approx \frac{\sigma_{\text{idx}}^2}{\bar{\sigma}^2}$ . A “pure” dispersion book is effectively *short*  $\rho$ : short index options, long a basket of single-stock options, *vega-weighted* so a parallel shift in implied vol minimally impacts P&L. If realized correlation falls below implied, the position earns carry and mark-to-market.

### 3 Dirty Dispersion in Practice

The equal-vol, equal-weight, frictionless world behind (2) never exists on a desk. Empirically observed frictions include:

- (a) **Execution friction.** You trade *hundreds* of single names with heterogeneous smiles and term structures; crossing bid-asks and rebalancing churn consume theoretical edge.
- (b) **Vega vs. Gamma.** Books are sized on vega notionals, but correlation shocks transmit via *gamma* in stress; a vega-neutral book is not corr-neutral in large moves.
- (c) **Funding & margin.** Long single-name options consume margin/cash; index shorts free less margin than expected. Carry, financing, and borrow add drag.
- (d) **Liquidity asymmetry.** Index options are deep; long-basket liquidity is patchy. “Parallel” strikes/tenors across 100–500 names is a myth; curvature mis-matches accumulate.
- (e) **Flows distort surfaces.** Systematic long-dated put demand lifts index skew and long-end vol; single names underreact. The correlation surface is thus a *flow artifact*, not a model constant.

### 4 Practical Example: Clean Math vs. Dirty Reality

We reconstruct a realistic S&P-style example from the thread and compute both the *theoretical* edge and the *frictions* that erode it.

#### Setup (equal-weighted intuition)

- Index implied volatility:  $\sigma_{\text{idx,imp}} = 12\%$ .
- Average single-stock implied volatility:  $\bar{\sigma}_{\text{stk}} = 28\%$ .

Under the toy identity (equal-weight/equal-vol assumption),

$$\rho_{\text{imp}} \approx \frac{\sigma_{\text{idx,imp}}^2}{\bar{\sigma}_{\text{stk}}^2} = \frac{0.12^2}{0.28^2} \approx 0.184.$$

#### Ex-post reality

Assume realized correlation falls to  $\rho_{\text{real}} = 0.12$  (earnings dispersion, idiosyncratic tape), and the average stock vol realizes near 28%:

$$\sigma_{\text{idx,imp}}^2 = 0.12^2 = 0.01444, \quad \sigma_{\text{idx,real}}^2 \approx \bar{\sigma}_{\text{stk}}^2 \cdot \rho_{\text{real}} = 0.28^2 \cdot 0.12 = 0.00941.$$

Variance edge:

$$\Delta \text{Var} \approx 0.01444 - 0.00941 = 0.00503 \quad (\text{vol}^2 \text{ points}).$$

Sanity:  $\sigma_{\text{idx,imp}} \approx 12.0\%$  vs.  $\sigma_{\text{idx,real}} \approx 9.7\%$ . **Textbook takeaway:** short index vol / long single-stock vol profits as correlation drops  $0.184 \rightarrow 0.12$ .

#### Where the edge dies if you're sloppy

**1) Execution drag (basket crossing).** Trade the top 200 names; average all-in spread cost  $\sim 1.5$  bps (vega-weighted, relative to index-notional P&L):

$$\text{Round-trip slippage} \approx 200 \times 1.5 \text{ bps} = 300 \text{ bps}.$$

That is *3% of index-notional P&L*. If your variance edge translates to only a few percent-of-vega across the life, 300 bps can nuke it.

**2) Funding / carry.** Long single-name options consume margin; index shorts free less than you think. Add  $\sim 50\text{--}100$  bps/year (repo, margin, borrow). Over 3–6 months, subtract another 15–50 bps.

**3) Surface mismatch (residual vega/gamma).** Vega-neutral sizing does not immunize gamma in stress or skew curvature when names gap differently. MTM noise can rival the corr edge unless you rebalance ruthlessly (which costs more spread).

### Clean math edge vs. dirty realized outcome

- **Model edge:** correlation drop  $0.184 \rightarrow 0.12 \Rightarrow$  variance advantage  $\approx 0.00503$  ( $12.0\% \rightarrow 9.7\%$  on the index leg, holding stock vols steady).
- **Dirty drag:**  $\sim 300$  bps basket crossing + 15–50 bps funding + mismatch/gamma noise can *fully offset* the advantage unless:
  - you restrict to liquid names (tighter quotes),
  - time entries around known flow,
  - size on vega-notional but monitor gamma,
  - and automate rebalance logic to minimize churn.

## 5 P&L Attribution: Pure vs. Dirty

Table 1: P&L Components: Clean Model vs. Dirty Realization

Component	Clean (Pure Dispersion)	Dirty (Realized on Desk)
Correlation P&L	Short corr earns carry when realized < implied	Still present, but sized/timed; partially offset by frictions
Execution P&L	Frictionless trades, zero slippage	Bid–ask crossing, rebalancing churn, market impact
Carry / Funding	Ignored	Theta – repo/margin/borrow drag
Residual Vega / Curvature	Negligible	Skew convexity, surface misalignment, name-specific smiles
Gamma / Delta Hedging	Perfect	Imperfect under stress; vol-of-vol and tail corr shocks

## 6 Visualizations

### 6.1 Correlation Term Structure: Theoretical vs Observed

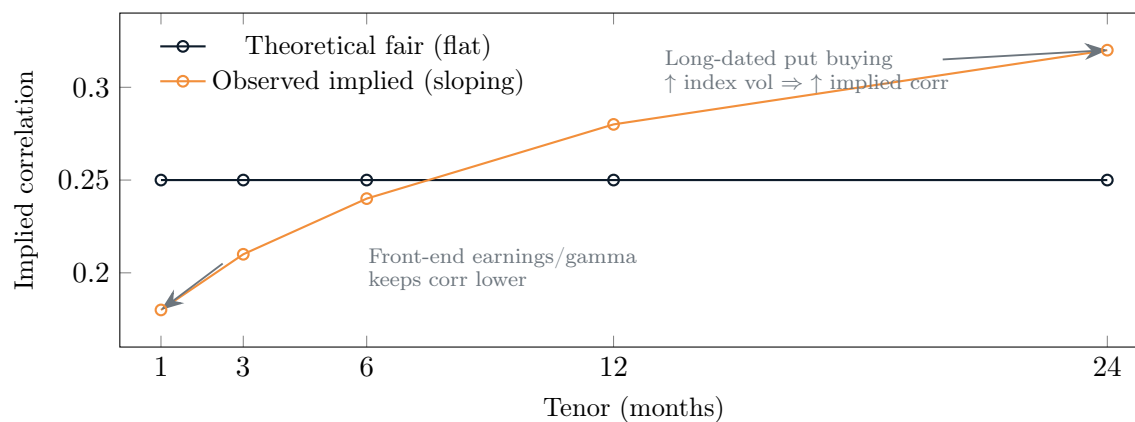


Figure 1: Flows bend the correlation curve. Long-end hedging demand lifts index vol relative to single stocks, raising long-tenor implied correlation.

### 6.2 “Pure” vs “Dirty” Dispersion: P&L Anatomy

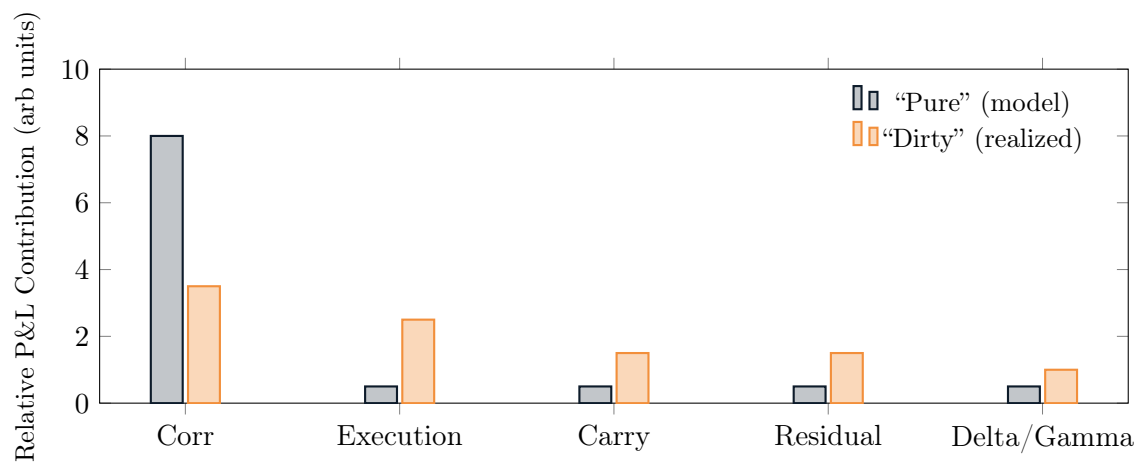


Figure 2: The model says “short correlation earns carry”; the desk says “only if it survives execution, funding, and curvature mis-matches.”

### 6.3 Execution Friction Schematic (Optional)

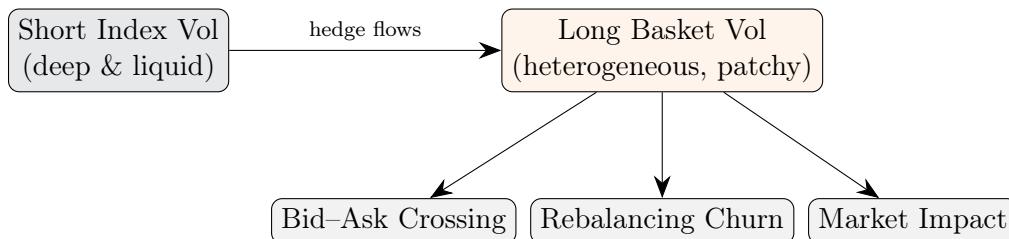


Figure 3: Execution frictions multiply across a large basket: you do not cross one spread, you cross *hundreds*.

## 7 Conclusion

- “Pure” dispersion is didactic: vega-neutral, correlation-isolated, frictionless.
- Real P&L comes from *dirty* dispersion: flow-aware, execution-aware, funding-aware.
- You do not arbitrage correlation cleanly; you harvest correlation premia when index vol is flow-distorted, single-stock vol is slow, and your infrastructure recycles risk faster than costs erode it.