

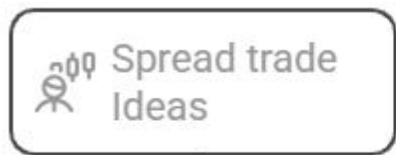
Constructing Portfolios of Spreads

Paul Teetor
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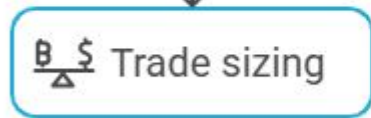
Hat tip to

- Peter Carl *for many useful conversations*
- Vorobets, Anton (2022) - “Portfolio Management Framework for Derivative Instruments”

Got alpha. Now what?



- Seasonals
- Mean reverting
- Relative value



- Back of the envelope
- Inverse vol.
- No covariance
- No cool metrics

- How can I access textbook techniques, such as risk parity?
- How can I construct useful metrics of performance and risk?
- All returns-based
- Simple returns do not work:

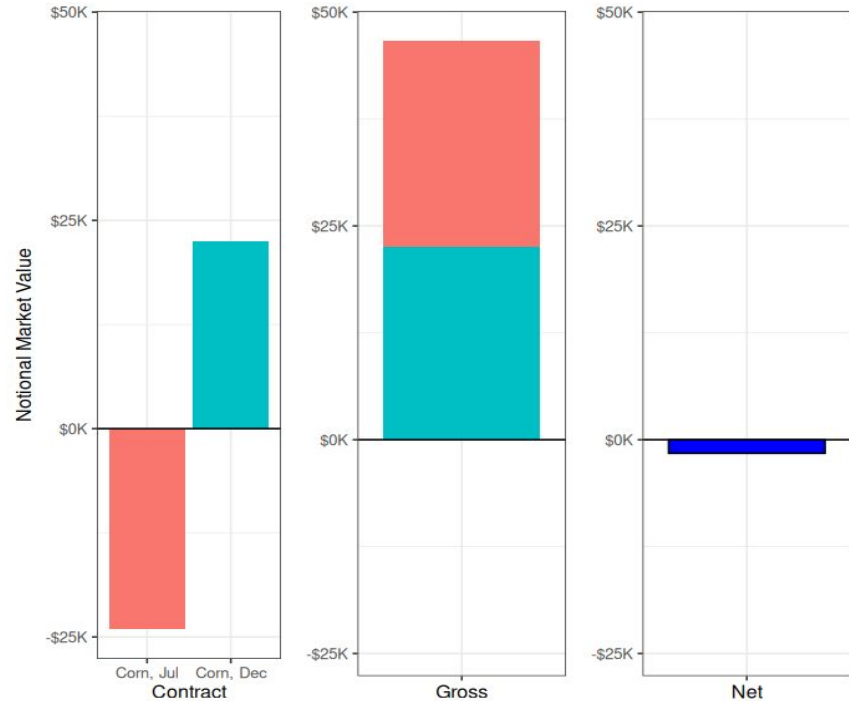
$$R_t = \Delta S_t / S_{t-1}$$

Anatomy of a spread trade: Notional market values

- *Contract*: what we trade
- *Gross*: sum of absolute value
- *Net*: simple arithmetic sum

Gross Market Value is the underlying economic value of the commodities.

Change in Net Market Value is the P&L of the spread.



Can a spread trade have a “return”?

This does not work:

$$R_t = \Delta S_t / S_{t-1}$$

This is unintuitive, but it works:

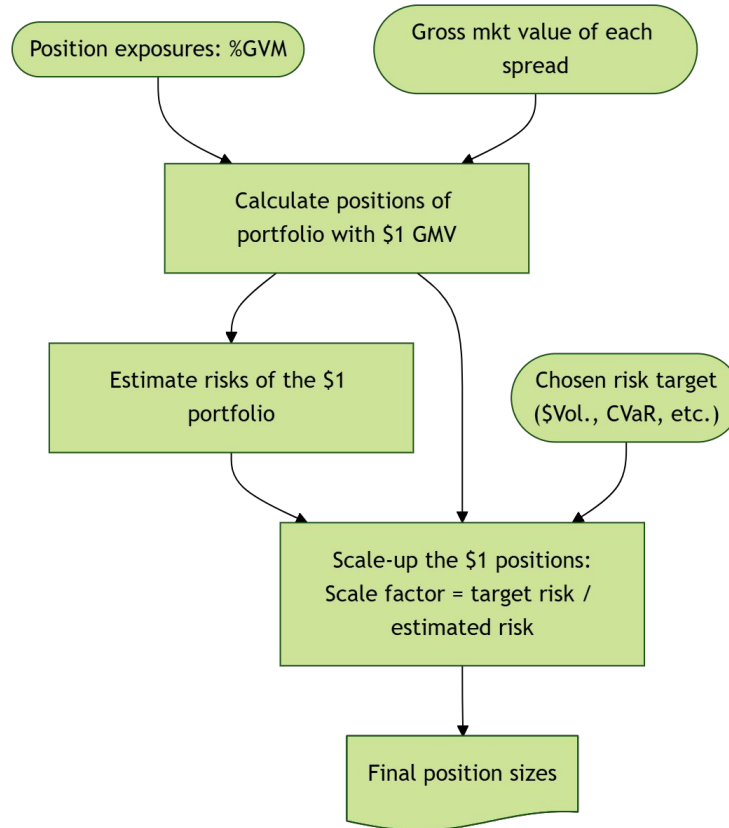
$$R_t = \Delta Net_t / Gross_{t-1}$$

- Just a mathematical contrivance? Well, yeah.
- Gateway to returns-based analysis
 - Portfolio construction techniques, e.g. risk parity
 - Cool analytics, e.g. CVar, all of Performance Analytics

Build the portfolio from expected returns?

- *Position exposure*: Fraction of *portfolio's total gross market value* assigned to each position
 - *Exposures are a relative measure*
- Translate exposures into position sizes
 - *Whereas sizes are absolute*
- Easy to interpret for long-only stock portfolios
- Would not work for futures and spreads
 - Result: Very over-collateralized positions with tiny little P&L
 - “Exposure of GMV” not intuitive either

From exposures to position sizes



Shiny app does construction and sizing

The screenshot shows a web browser window displaying a Shiny application titled "Portfolio rebalancing". The app interface includes several interactive elements and data displays:

- Base portfolio:** A dropdown menu set to "tau".
- Rebalance to:** Radio buttons for "Unchanged", "Equal exposure", "Inverse vol", "Min vol", "Eq CVar contrib", and "Eq risk contrib" (selected).
- Resize to:** Radio buttons for "Same gross notional", "Same vol (\$)", "Target net vol (\$)" (selected), and "Single spreads".
- Target net vol adjustment:** A slider ranging from -20 to 20, currently set at 0.
- Data window:** A dropdown menu set to "3 mo".
- Assumptions:** A list at the bottom left stating: "Assumed capital is \$1,000,000", "Target daily vol is \$12,500", and "Currently holding 3 positions".
- Add/Remove controls:** Dropdowns for "Add" (set to "None") and "Remove" (set to "None"), with a "long" radio button selected.
- Navigation tabs:** "Rebalance" (active), "CTR", "Correlations", "Network plot", and "Details".
- Menu:** A "Menu" button with a dropdown arrow.
- Tables:**
 - Current Holdings Table:**

Symbol	Side	Quantity			Exposure			Contrib	Pct CTR
		Base	Rebal	Change	Base	Rebal	Change		
-HO22025M+HO22025U	short	-20	-16.2	3.8 closing	41.9%	33.3%	-8.6%	909.4	9.6%
-LC_2025G+LC_2025O	short	-20	-20	0	34.0%	33.3%	-0.7%	5,270.1	55.9%
-TY22025M+US22025M	short	-10	-14.1	-4.1 opening	24.1%	33.3%	9.2%	3,252.0	34.5%
 - Rebalanced portfolio Table:**

Date	TotalOpenInt	GrossMarketValue	NetMarketValue	ReturnsVol	DollarVol	DollarCVAR
2025-01-09	50.2	\$9,284,513	-\$4,815	5.41%	\$9,375	-\$19,455

User selects the exposure calculation and risk target

- Calculate exposures using:
 - Equal exposure
 - Minimum volatility
 - Inverse volatility
 - Equal CVaR contribution
 - Equal contribution to risk - *risk parity*
 - Unchanged
- Scale to risk target:
 - Simple dollar volatility (ignore covariance)
 - Net dollar volatility (use covariance)
 - CVaR
 - Net gross notional value
 - Unchanged

Available analytics

- *Position: exposure, position dollar vol, Pct CTR, CVaR*
- *Portfolio: gross & net mkt value, portfolio \$vol, CVaR, returns correlations*

So what?

- Portfolio sizing is clean and transparent
- Risk management appears improved
 - Profits and losses seem better balanced
 - Overall behavior is more consistent
- Easily extends to other asset types
 - Stocks, stock spreads
 - Outright futures
 - Fixed income
- Limitations:
 - Live and die by covariance matrix?
 - Does not handle options and option spreads