Homework: Simple Spread Trading

Thursday 16th January, 2025

1 Introduction

A spread trading strategy checks a running estimate of the displacement between two related instruments, and makes bets that this displacement will decline whenever it gets large. Here, we define that displacement in terms of recent returns.

2 Data

Obtain split- and dividend-adjusted closing prices[1] for 2 Dec 2022 though 15 Nov 2024 the SVOL volatility ETF[2] and of a pair of ETFs (which we will call X and Y) as specified below. Estimate daily dollar volume, compute the running trailing 15-trading-day median of it over our sample period for X, and denote that running median (as of any day given t) for the *less* liquid of the two ETFs with the expression N_t.

$$N_t := \text{Median}\left[\{V_{t-15}, V_{t-14}, \ldots, V_{t-1}\}\right] \tag{1}$$

Obtain daily Fama-French factor returns[3] (SMB, HML, RF and Mkt-RF) over the same data period.

[1] The Quandl EOD database and Bloomberg are the best two sources for this.

[2] The SVOL fund is a rough proxy for the market's expected volatility and activity

[3] Available under "Downloadable Files" through last November from on Ken French's website

3 Exercise

3.1 Positions

Create code for a spread-reversion trading strategy that begins just after January 1 2023, and closes all existing positions at 15 Nov 2024 close prices. For this homework, make the unrealistic assumption that you can trade at end-of-day closing prices from the database, minus trading costs.

Your strategy's "trades" are equal-sized dollar amounts of X and Y to the nearest integer number of shares, as close as possible to $\$N_t/100$ of each. Note that N_t changes every day, so trade size will depend on which day you open the position. Your gross traded cash on position entry is therefore roughly $\$2N_t/100$. Track this number on any open position for later stop loss calculations.

The strategy enters or maintains a position if the size of difference z between the M-day return on X and Y is greater than g, and flattens (exits) the position if the size of the difference is less than j (where we always have $j < g$). It does so by shorting the security whose recent return is higher, and buying the security whose recent return is lower. Note that if the change in z is large enough the position can flip from shorting the spread to being long the spread and vice versa, as discussed in class.

You only ever hold, at most, one long and one short position (i.e. one spread position). If you already have a position and the next tick is favorable to it, this simply means you continue to hold the position (except in stop loss situations). Do not adjust position size with the new N_t.

3.2 Mark To Market

When a position is open, keep track of its profits/losses (PnL). You will also want to keep track of cumulative PL across the whole series of opened and closed positions.

3.3 Stop Loss

Include a stop loss parameter s in your strategy. If your simulation experiences a day such that the present position value has lost more than a proportion s of the gross traded cash G (|\$long| + |\$short| at position entry

time), then force an exit at current prices, assume no new positions for the remainder of the month, and include this in your accounting.

3.4 End Of Data

Force a position close at the end of the analysis period.

3.5 Trading Costs

Assume a proportional trading cost parameter ζ in your strategy analysis. On trade the immediate losses are ζ times the gross traded entry position cash. On exit they are ζ times the gross traded exit position cash.

3.6 Capital

Set the capital K for your strategy to the maximum of N_t over the data period, times two[4]. You can use this to evaluate return on capital.

[4]This setting has lookahead bias but is good enough for now. We set it very large like this to avoid the nonsensical situation of negative capital.

3.7 Data

ETF pairs X,Y (in order) are as given by the last digit of your student number as follows:

0. SCYB JNK
1. RING GDX
2. FTXL SMH
3. PBE XBI
4. RTH XRT
5. KXI XLP
6. IAT KRE
7. GII IGF
8. IDU XLU
9. PKB AIRR

4 Analysis

Study the performance[5] of your strategy as you vary j, g, s, ζ and M. You can choose just two different values for ζ: zero (costless opportunity) and 0.00001.

Include plots. You need not run a fancy nonlinear optimizer, but try to find which parameters work well, and explain how you did it. For one or more of the better settings you find, look into correlations to Fama French factor returns. Consider relationships of trading rate or profitability in your strategy to SVOL levels.

Be sure to highlight which ETF pair you are analyzing.

[5]Because we are setting capital to such a high number, returns on capital are small. Do not be alarmed by that.