

# Homework: Simple Spread Trading

Friday 2<sup>nd</sup> April, 2021

## 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<sup>1</sup> for 2 Dec 2018 through 31 Dec 2020 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  $N_t$ .

$$N_t := \text{Median} [\{V_{t-16}, V_{t-15}, \dots, V_{t-1}\}] \quad (1)$$

Obtain daily Fama-French factor returns<sup>2</sup> (SMB, HML, RF and Mkt-RF) over the same data period.

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<sup>1</sup>The Quandl EOD database and Bloomberg are the best two sources for this.

<sup>2</sup>Available on Ken French's website

## 3 Exercise

### 3.1 Positions

Create code for a spread-reversion trading strategy that begins on the first day of each month, trades during the month, and closes any open positions the end of each month (i.e. the first potential day for a trade is just after January 1 2019). For this homework, make the unrealistic assumption that you can trade at end-of-day closing prices from the database.

Its 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 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  $s$  of difference 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  $j < g$ ). It does so by shorting the security whose recent return is higher. Note that if the change in  $s$  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 ( $|\$long| + |\$short|$  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 Capital

Set the capital  $K$  for your strategy to the maximum of  $N_t$  over the data period, times two<sup>3</sup>. You can use this to evaluate return on capital.

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<sup>3</sup>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.

### 3.6 Data

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

0. FCOM VOX
1. RYE XOP
2. PXJ OIH
3. RYU XLU
4. RTH XRT
5. SIVR SLV
6. HYLD JNK
7. RING GDX
8. FTSL SMH
9. PBE XBI

## 4 Analysis

Study the performance of your strategy as you vary  $j$ ,  $g$ ,  $s$ , and  $M$ . You need not run a fancy nonlinear optimizer, but try to find which parameters work well. For one or more of the better settings you find, look into correlations to Fama French factor returns.

Be sure to highlight which ETF pair you are analyzing.