Futures Spread Trading Analysis

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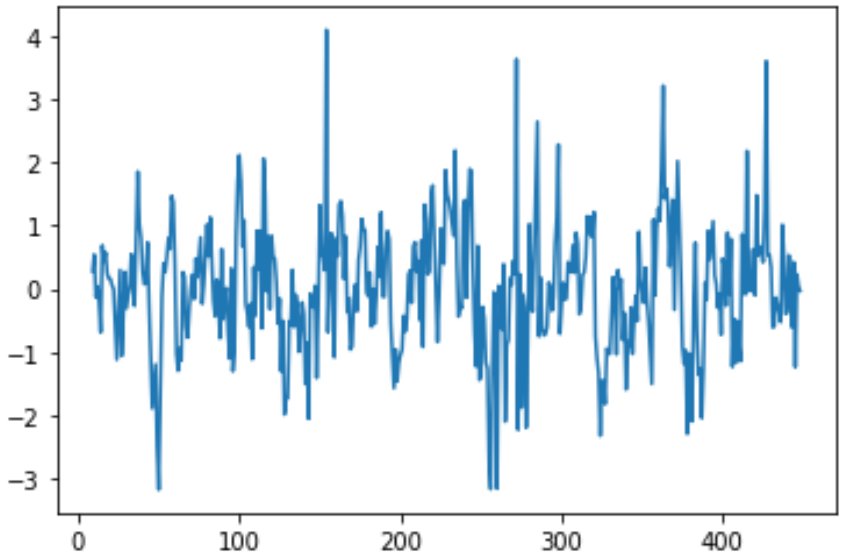
1.Data

The spread trading involves two treasury future contract, 'ICE B B' and 'ICE G G' for 2 Dec 2017 though 31 Aug 2019 from the Quandl OWF database. X is ICE B B, Y: ICE G G, and the raw Spread is $r_t = Y_t - X_t$.

$\ddot{r}_t^{(M)}$ is the trailing M-day moving average of raw spread. The indicative strategy spread is $s_t = r_t - \ddot{r}_t^{(M)}$.

2.Strategy

For my strategy, I tried many pairs of parameters for j, g, M and S. The logic is assuming the spread we trade have a mean-reversion pattern. When the spread hits somewhere higher than g, I enter the market with a short position and I exit when it hits somewhere smaller than j. When the spread decreases sharply and if it goes to the point smaller then -g, I enter the market with a long position and I exit when it hits somewhere larger then -j.

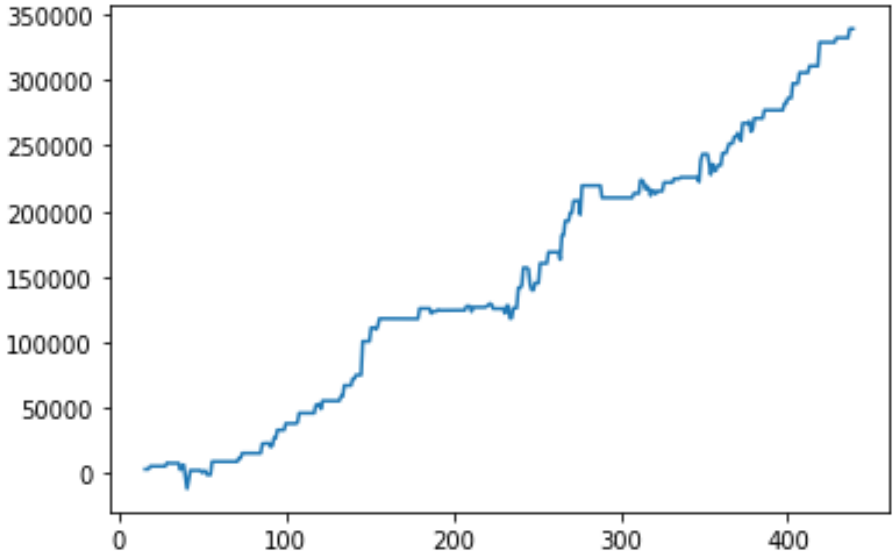


I firstly normalized the indicative strategy spread to see reasonable choices of j and g with M and S fixed. The above plot is the normalized indicator with M = 10 and S = 0.05. After I ran the opportunity test using the loops and compared their Sharpe ratios, I chose j = 0.9, g = 1, M = 10 and S = 0.05 because they produced a quite stable and reasonable return during the whole period.

3. Analysis

(a) Analysis of PnL curve.

The PnL curve of the strategy is shown in the following chart. As we can see from the curve, the profit and loss are quite stable. Overall, the strategy is making money for every month. The maximum drawdown is very low in contrast to the total profit because of the setting of stop loss point.



(b) Sharpe and Sortino Ratios

The simulated returns have a Sharpe ratio of 0.213949 and Sortino ratio of 0.243398 daily, with a benchmark daily return to be 0. The daily return is extremely low because we have an initial capital of 100MM but every gross traded notional is only around 1MM. If we set the benchmark daily return to be the risk-free return, we have negative Sharpe and Sortino ratios, which are -5.258016 and -5.258016 respectively.

(c) Regression Analysis

Since the daily return is low, when I used risk-free rate to extract it, the excess return is actually negative and has a similar absolute value to the risk-free rate, which is a bit confusing. The regression result and the Sharpe and Sortino ratios of residuals are shown in the table below.

	Regression1	Regression2	Regression3	Regression4		
Factor	Mkt-RF	SMB	HML	Mkt-RF	SMB	HML
Coefficient	-0.000148	0.000757	0.001320	0.000056	0.001020	0.001496
T Value	-0.381949	0.982486	1.926814	0.137711	1.309127	2.066063
Sharpe	-5.238325	-5.163862	-4.600652	-4.450766		
Sortino	-5.238325	-5.163862	-4.600652	-4.450766		

As we can see from the univariate regression where each of the Fama-French Factors is the exogenous variable, only HML has some significant relationship with the return of our strategy. Therefore, the

residual has a significantly better Sharpe and Sortino ratio only from the regression equation of HML being the independent variable. From the multivariate regression, we can see that still HML matters most for our strategy return although the t value of SMB also increases a bit. If we can hedge using the three factors. The Sharpe ratio can be increased from -5.258016 to -4.450766.