Trading sovereign debt futures Ravenpack news based machine learning signal

DUPREY Stefan

Plan 2

Plan

- 1. Building our pair trading signal
- 2. Weights expression
- 3. Visualizing the confidence threshold

1. Building our pair trading signal

Our ML algorithm outputs us with two predictions: the return for the first bond future x_1 and the return for the second bond future return x_2 , both for the same chosen rebalancing time period. We want to build our weights with the following properties, where T is a threshold parameter to limit our spread exposure 0 < T < 1. T might also be seen as a guardrail when one of our prediction has low confidence: x_1 or x_2 is near zero.

$$\begin{cases} |\omega_{1} + \omega_{2}| = 1 \\ \operatorname{sign}(\omega_{1}) = \operatorname{sign}(x_{1}) \\ \operatorname{sign}(\omega_{2}) = \operatorname{sign}(x_{2}) \\ \frac{\omega_{1}}{\omega_{2}} = \frac{x_{1}}{x_{2}} \\ \text{if } \omega_{1} + \omega_{2} = 1, \text{ then } \max(\omega_{1}, \omega_{2}) \leq 1 + T \\ \text{if } \omega_{1} + \omega_{2} = -1, \text{ then } \min(\omega_{1}, \omega_{2}) \geq -1 - T \end{cases}$$

$$(1)$$

2. Weights expression

$$\begin{cases} x_{1} > 0, x_{2} > 0 \begin{cases} \omega_{1} = \frac{x_{1}}{x_{1} + x_{2}}, \ \omega_{2} = \frac{x_{2}}{x_{1} + x_{2}} \\ \omega_{1} + \omega_{2} = 1, \ 0 < \omega_{1} < 1, \ 0 < \omega_{2} < 1 \end{cases} \\ x_{1} < 0, x_{2} < 0 \begin{cases} \omega_{1} = -\frac{x_{1}}{x_{1} + x_{2}}, \ \omega_{2} = -\frac{x_{2}}{x_{1} + x_{2}} \\ \omega_{1} + \omega_{2} = -1, \ -1 < \omega_{1} < 0, \ -1 < \omega_{2} < 0 \end{cases} \\ x_{1} < 0, x_{2} > 0, |x_{1}| > x_{2} \begin{cases} \omega_{2} = \min(-\frac{x_{2}}{x_{1} + x_{2}}, T), \ \omega_{1} = -1 - \omega_{2} \\ -1 - T < \omega_{1} < -1, \ 0 < \omega_{2} < T \end{cases} \\ x_{1} < 0, x_{2} > 0, |x_{1}| < x_{2} \begin{cases} \omega_{1} = \max(\frac{x_{1}}{x_{1} + x_{2}}, -T), \ \omega_{2} = 1 - \omega_{1} \\ -T < \omega_{1} < 0, \ 1 < \omega_{2} < 1 + T \end{cases} \\ x_{1} > 0, x_{2} < 0, |x_{2}| > x_{1} \begin{cases} \omega_{1} = \min(-\frac{x_{1}}{x_{1} + x_{2}}, T), \ \omega_{2} = -1 - \omega_{1} \\ 0 < \omega_{1} < T, \ -1 - T < \omega_{2} < -1 \end{cases} \\ x_{1} > 0, x_{2} < 0, |x_{2}| < x_{1} \begin{cases} \omega_{2} = \max(\frac{x_{2}}{x_{1} + x_{2}}, -T), \ \omega_{2} = 1 - \omega_{1} \\ 1 < \omega_{2} < 1 + T, \ -T < \omega_{2} < 0 \end{cases} \end{cases}$$

3. Visualizing the confidence threshold

