Trading sovereign debt futures Ravenpack news based machine learning signal

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Plan

1. Building our pair trading signal
2. Weights expression
3. Predictors importance

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.

$$\begin{cases} |\omega_1 + \omega_2| = 1 \\ \text{sign}(\omega_1) = \text{sign}(x_1) \\ \text{sign}(\omega_2) = \text{sign}(x_2) \\ \frac{\omega_1}{\omega_2} = \frac{x_1}{x_2} \\ \text{if } \omega_1 + \omega_2 = 1, \text{ then } \max(\omega_1, \omega_2) \leq 1 + T \\ \text{if } \omega_1 + \omega_2 = -1, \text{ then } \min(\omega_1, \omega_2) \geq -1 - T \end{cases} \tag{1}$$

2. Weights expression

$$
\begin{cases}
x_1 > 0, x_2 > 0 \begin{cases} \omega_1 = \frac{x_1}{x_1+x_2},\ \omega_2 = \frac{x_2}{x_1+x_2} \\ \omega_1 + \omega_2 = 1,\ 0 < \omega_1 < 1,\ 0 < \omega_2 < 1 \end{cases} \\
x_1 < 0, x_2 < 0 \begin{cases} \omega_1 = -\frac{x_1}{x_1+x_2},\ \omega_2 = -\frac{x_2}{x_1+x_2} \\ \omega_1 + \omega_2 = -1,\ -1 < \omega_1 < 0,\ -1 < \omega_2 < 0 \end{cases} \\
x_1 < 0, x_2 > 0, |x_1| > x_2 \begin{cases} \omega_2 = \min(-\frac{x_2}{x_1+x_2}, T),\ \omega_1 = -1 - \omega_2 \\ -1 - T < \omega_1 < -1,\ 0 < \omega_2 < T \end{cases} \\
x_1 < 0, x_2 > 0, |x_1| < x_2 \begin{cases} \omega_1 = \max(\frac{x_1}{x_1+x_2}, -T),\ \omega_2 = 1 - \omega_1 \\ -T < \omega_1 < 0,\ 1 < \omega_2 < 1 + T \end{cases} \\
x_1 > 0, x_2 < 0, |x_2| > x_1 \begin{cases} \omega_1 = \min(-\frac{x_1}{x_1+x_2}, T),\ \omega_2 = -1 - \omega_1 \\ 0 < \omega_1 < T,\ -1 - T < \omega_2 < -1 \end{cases} \\
x_1 > 0, x_2 < 0, |x_2| < x_1 \begin{cases} \omega_2 = \max(\frac{x_2}{x_1+x_2}, -T),\ \omega_2 = 1 - \omega_1 \\ 1 < \omega_2 < 1 + T,\ -T < \omega_2 < 0 \end{cases}
\end{cases}
\tag{2}
$$

3. Predictors importance

At each observation time we have to regress our stock returns to our stock factors :