

Method

- acquiring data and cleaning it
- determining, understanding and creating the features that will help the model
- defining the kalman filter to accommodate the feature
- normalization of the Kf over a 20 day rolling window
- random forest with 70% train split

Trading Logic

- A position is created when both ML model proves up and kalman filter has a positive relationship
- Signals are shifted by a day so that we take into account the closing price of the previous day to execute the trade
- Transaction costs of 10 basis points that is 0.1% to account for the brokerage and service fee

Assumptions:

- It assumes that past patterns in technical indicators and dynamic relationships can predict future price,
- The transaction costs are fixed despite the market volatility
- The filter's transition and observation covariances are assumed to be appropriate for the asset's typical behavior
- A \$100000 fund to invest in the stock

Performance Analysis:

The analysis is done using parameters that show capital gain and the volatility of the market. We use total returns and sharpe ratio to fulfill the parameters.
Also there are some plots that has been generated using AI.

SUMMARY:

Adding a rolling z-score to the Kalman spread really helps the model spot when prices have stretched too far compared to where they've been lately. Even though we're using a Random Forest for the final decision, the whole thing works because the Kalman Filter gives us a solid "Fair Value." To make it even better down the road, we could try adjusting how big our positions are based on volatility. That should help keep the Sharpe ratio nice and steady, especially when the market gets bumpy.