Capstone 3 Proposal

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Problem Statement:

I will create a simple trading strategy that uses nontraditional objective functions to predict future returns and set position sizes.

Context:

Traditional investment strategies are broken down into two parts, forecasting and position sizing. These are typically completely separate decision processes. For example, one can use a variety of variables to forecast the future returns of an asset. Once their forecast is determined, they will either go long or short the asset based on sign of the forecast. Sizing is based on predicted returns, volatilities, and correlations of all the assets in the portfolio.

The first part of my solution will improve the forecasting step. While forecasting models have gotten more complex, it is still industry standard to use a simple mean squared error objective function for any prediction model. This may provide more accurate prediction but doesn't reflect the real life asymmetries of the investment process. If a prediction of +1% is made and the investor goes long the asset, they will obviously have a preference between an actual result of +3% vs. -1%. However, this preference will be disregarded by traditional symmetric objective functions because the actual difference is 2% in both cases.

Secondly, I will try to address the position sizing problem by combining it with the forecasting step. Rather than forecast future returns and go long or short the asset depending on the sign of the forecast, I will create a custom loss function and train a model to predict position sizes directly. This is a more difficult supervised learning problem because we don't have direct labels of optimal position sizes in the data set, we just have actual returns. Therefore, I have chosen to instead optimize for specific portfolio performance measures (Sortino Ratio) which will achieve a similar goal.

Criteria for Success:

In order to determine how successful my strategy is, I will simply compare it to a few traditional benchmark portfolios strategies. It is straightforward to compare a wide variety of portfolio performance metrics such as absolute returns, Sharpe Ratio, Sortino Ratio, and Max. Drawdown. I aim to outperform across all these measures.

Scope of Solution Space:

While my proposed strategy can really be applied to any trading strategy, I've restricted my solution space to the available data I have and am only using a small set of self-contained features that are traditionally used in academia.

Constraints:

The largest constraint I have is the data itself. I have chosen to use freely found returns data from various futures exchanges. While it optically looks very similar to actual exchange data, if the study were to be expanded, I'd suggest actually purchasing the data directly from the exchanges. Financial data has a very low signal to noise ratio so the length of the historical analysis period is crucial. I have roughly 20 year's worth of data so I will need to include an appropriate amount of out of sample testing. Another constraint is that my investigation is meant to be a simple proof of concept. I do not include any transaction costs or trading impact analysis and leave those effects up to future study.

Stakeholders:
The methodology of this project truly has far reaching impact. The proposed strategy can be used in a single asset trading rule, a total portfolio approach, or on economic forecasting by itself. My implementation will be a sample trading strategy of multiple assets.

Data Sources:
All asset returns found via github repos and spot checked with Quandl.