

# Portfolio Selection – Project

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## Short Background of the Method Used:

First, we tested the standard methods as seen in class, such as: min variance portfolio, market portfolio, best basket portfolio etc. However, against our expectations, unfortunately, these methods yielded bad results as their portfolios were yielding negative or very low shape values.

Because we are data scientists engineers from the highly prestige Technion we decided to use deep learning methods, deep learning is used everywhere to solve basically everything. We used basic RNN network, the LSTM many to one to predict the next day based on the last few days. However, the portfolio market is too stochastically random that the network wasn't able to produce better results from the standard methods for the long run.

One of the best performing methods was to solve the optimization problem of maximizing the sharpe value over the train period (taking short time, about a week before the test) and allocate the portfolio accordingly. We saw the optimization gave some stocks relatively high weight and other very low.

In the end after testing many more ideas. We found a way to game the system. Because the portfolio is not limited, we have reached to the conclusion that we can find the best and least performing stocks in the near future (following couple of days) and give really high weight in the portfolio to the top stocks, and hard short the least performing stocks.

## Methods:

The method we chose at the end is a combination of our new idea to hard short the least performing stocks and buy a lot from the top performing short – we will call this the short-buy method and regularized min variance portfolio.

We are first predicting the best and least performing based on the last 5 days (we found that 5 days is the most reliable time period) based on a simple linear regression, then we the short-buy portfolio for the following x days, and we are using regularized min variance portfolio for the rest of the month.

## Experiments:

Besides the experiments with the methods mentioned above in *Short Background of the Method Used* we did a highly comprehensive cross validation to set our many hyper parameters. We tested different amounts of stock in our short-buy method, different weights, different splits in the short-buy and regularized min variance portfolios and many more.

We tested on several training and test dates to not overfit on a specific period. Eventually, we picked the parameters that yielded the overall best results on the most dates.