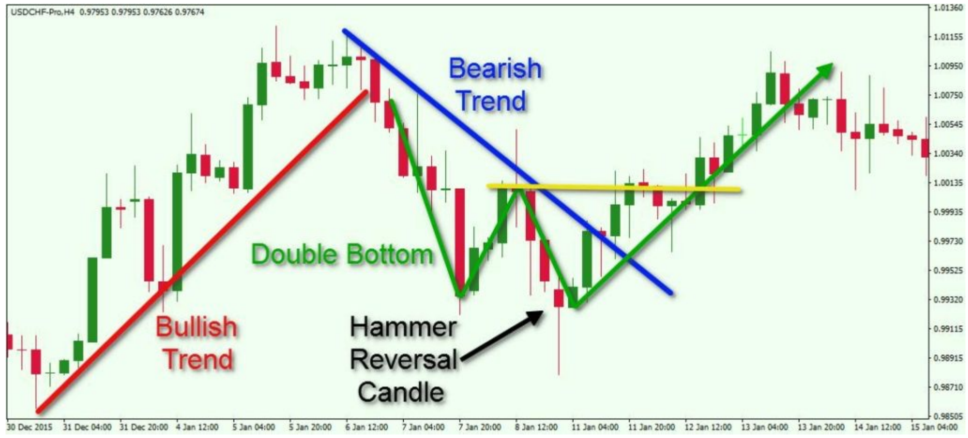
Stock Selection
for
Portfolio Optimization

How do we *‘properly select’* our portfolio?

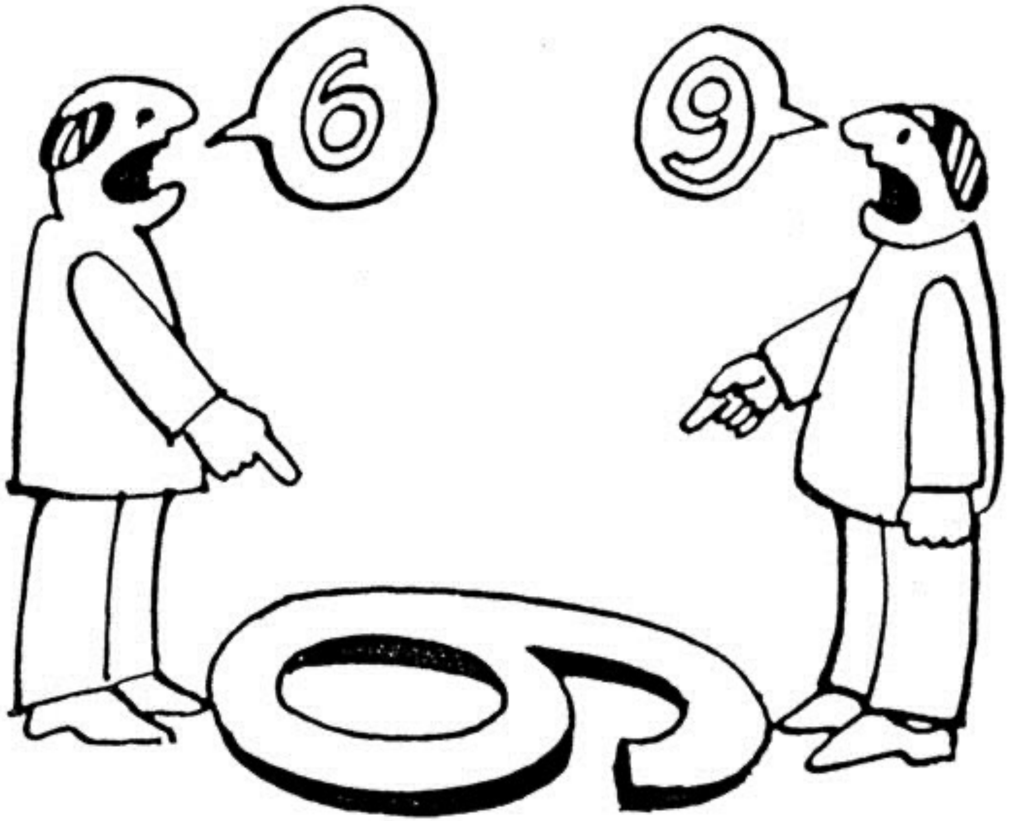
The consensus reached from the majority of past studies is that active management DOES NOT provide superior performance compared to passive investing (Fama & French, 2010).

There is a large body of evidence that supports the case for passive management. Studies have shown that the vast majority of active managers underperform the market (study by Standard & Poor's, from January 1, 2003, to December 31 2013).

Technical Analysis



Fundamental Analysis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$$Sharpe\ Ratio = \frac{Return}{Risk} = \frac{R_p - R_f}{\sigma_p}$$

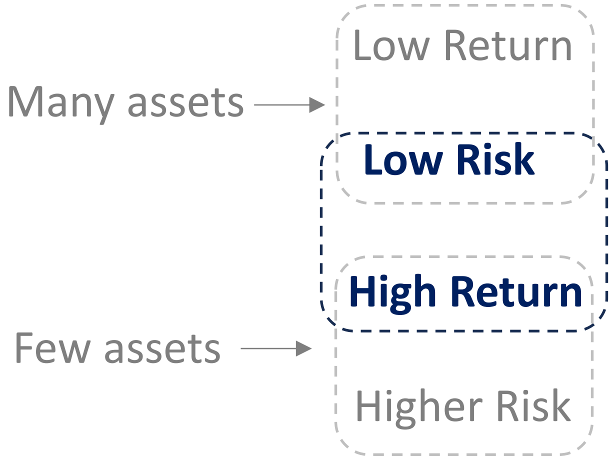
Volatility from correlation

$$\sigma_p = \sum_{i=1}^{n} \sum_{j=1}^{n} \boxed{\rho_{i,j}} w_i w_j \sigma_i \sigma_j$$

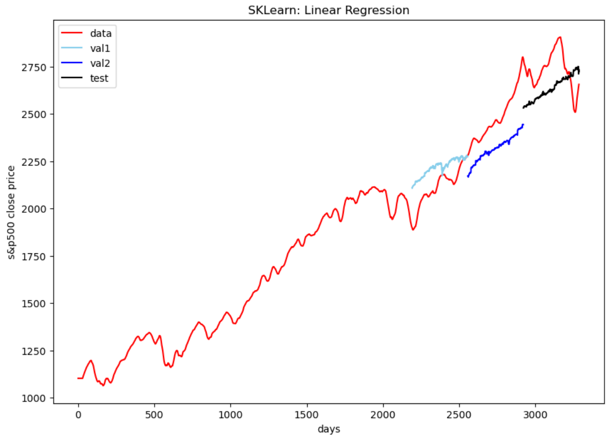
If correlation is negative, then that term becomes a subtraction

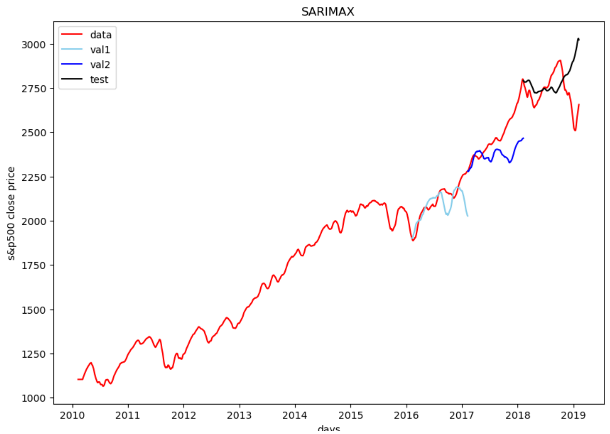
From Financial Mathematics

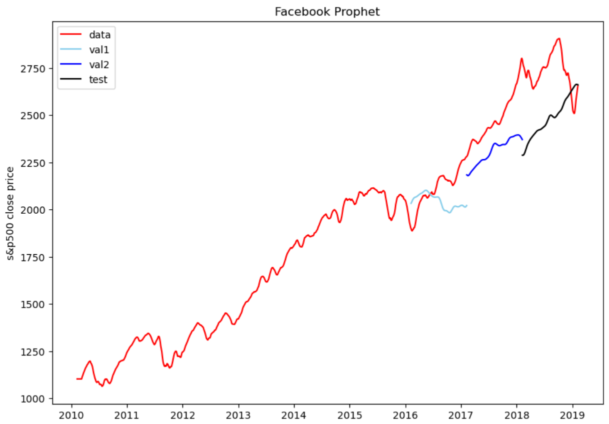
We are not only interested in the stock return but also interested in correlations between stocks

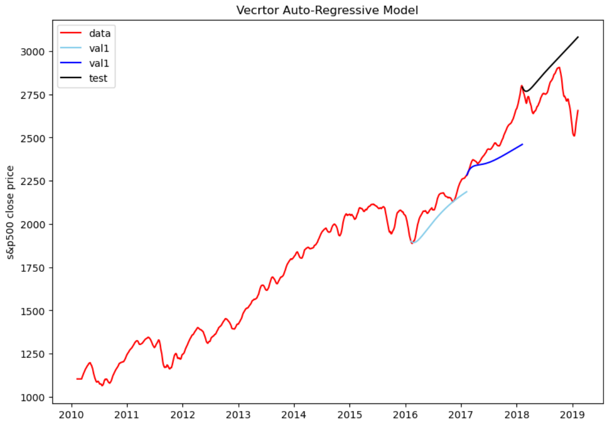


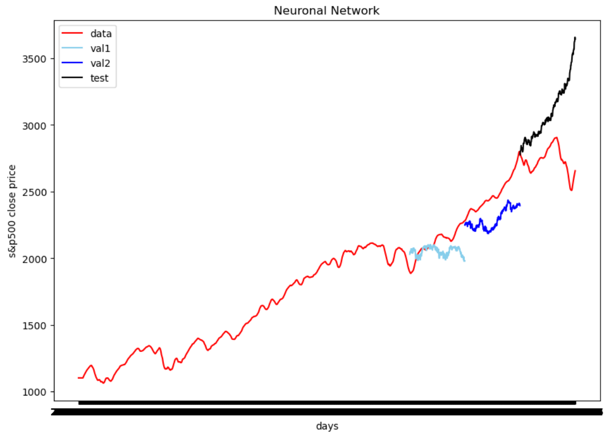
S&P500 stock’s **Return** predictive model

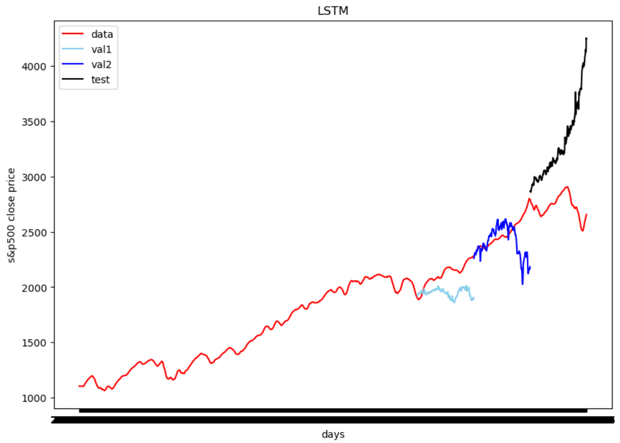


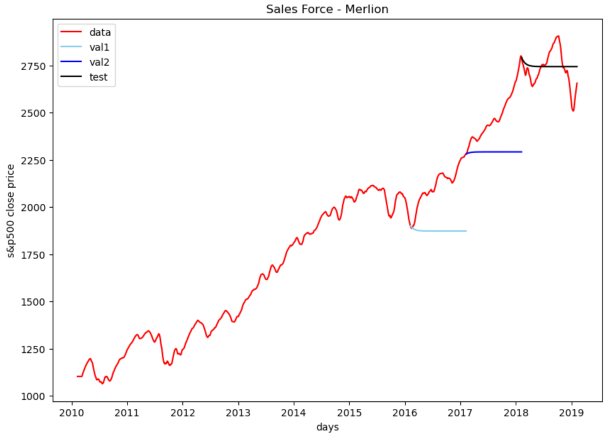


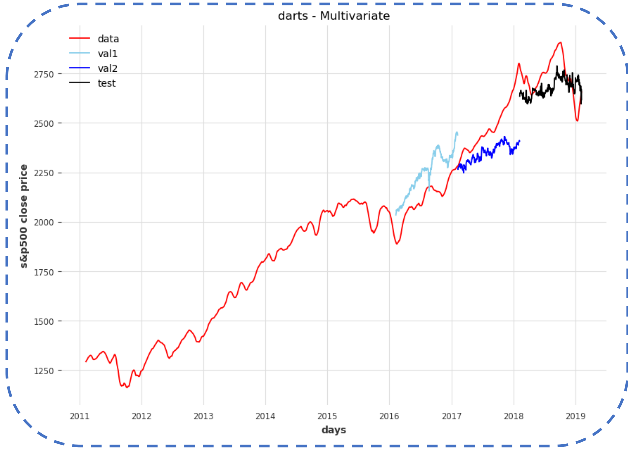












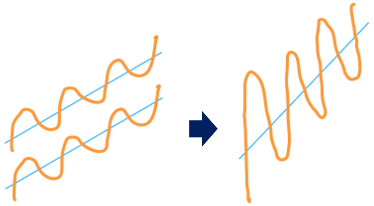
Mean Absolute Error (MAE)

Prediction	SKL - LR	SARIMAX	Prophet	VAM	NN	LSTM	Merlion	Darts Mult
1	103	2,079	119	75	97	174	1,105	132
2	262	2,223	171	103	188	314	1,261	133
3	481	24,223	138	178	358	1,178	1,329	93
Total	**846**	**28,525**	**428**	**356**	**643**	**1,666**	**3,695**	**358**

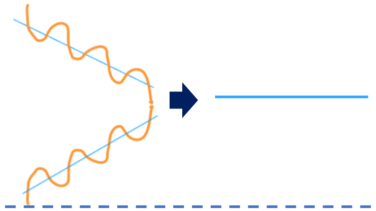
Better prediction of turning points

Optimization: Sequential Least SQuares Programming (SLSQP)

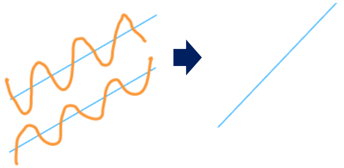
Maximizing **Returns**



Minimizing **Volatility**



Maximizing $\frac{Return}{Volatility}$



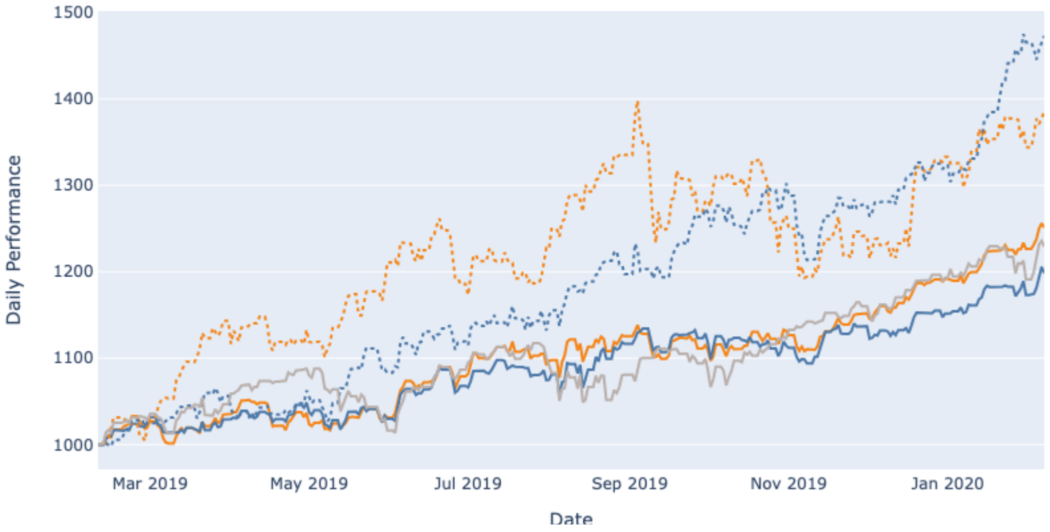
1) Selecting the **500 optimal weights** for the **500 stocks portfolio.**

2) Selected **the 30 stocks with the highest weight and normalized them**

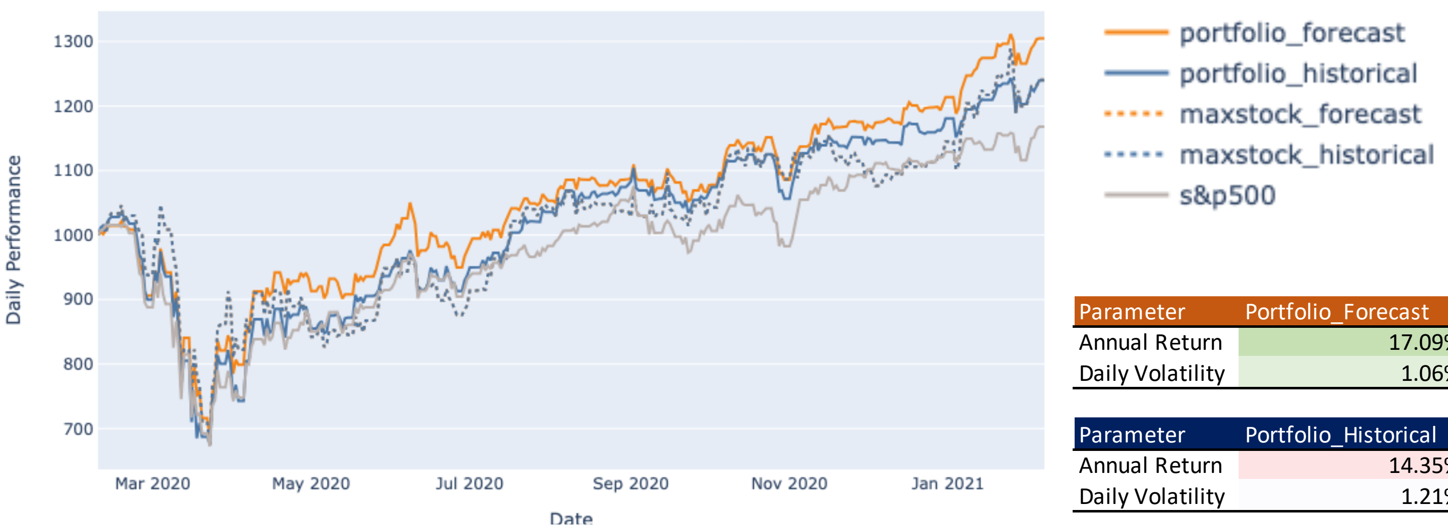
We are Maximizing the Sharpe Ratio

30 stocks based on financial theory

Portfolio Daily Performance (2019)



Portfolio Daily Performance (2020)



Parameter	Portfolio_Forecast
Annual Return	17.09%
Daily Volatility	1.06%

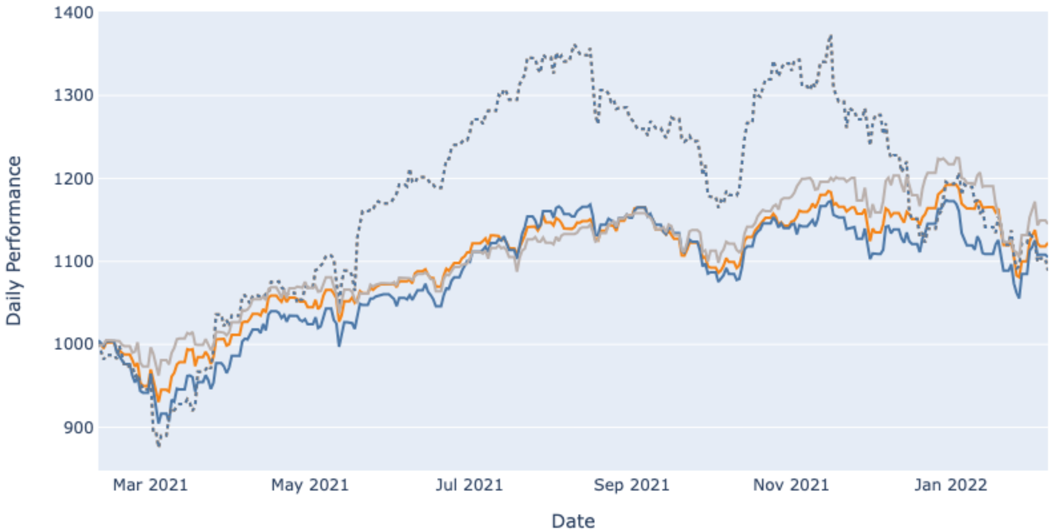
Parameter	Portfolio_Historical
Annual Return	14.35%
Daily Volatility	1.21%

Parameter	Max_Stock Forecast
Annual Return	15.95%
Daily Volatility	1.54%

Parameter	Max_stock Historical
Annual Return	16.07%
Daily Volatility	1.87%

Parameter	S&P500
Annual Return	11.28%
Daily Volatility	1.10%

Portfolio Daily Performance (2021)



Portfolio Daily Performance (2022)


THANKS!