ANALYZE FINANCIAL DATA USING PYTHON

ANALYSIS BY:
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Introduction

A young client is seeking advice on how to invest his money. He wants to invest a large amount of his savings in a portfolio of stocks, but he is unsure of what stocks to invest in and at what amounts.

Our model is going to help this client create an optimal portfolio that is tailored to his risk aversion.

Portfolio Candidates

For this client, we are going to be examining stocks from several different industries and sectors:

| Candidate	Industry	Sector
Microsoft (MSFT)	Technology	XLK - Technology
Tesla (TSLA)	Automotive and Energy	XLY - Consumer Discretionary
Sorrento Therapeutics, Inc (SRNE)	Biopharmaceutical	XLV - Health Care
Pfizer (PFE)	Biotechnology and Pharmaceuticals	XLV - Health Care
AllianceBernstein (AB)	Asset Management	XLF - Financials
JPMorgan Chase & Co (JPM)	Financial Services	XLF - Financials
Tyson Food Company (TSN)	Food processing	XLP - Consumer Staples
Hyatt Hotels Corporation (H)	Hospitality	XLY - Consumer Discretionary
Delta Air Lines, Inc (DAL)	Air Freight/Delivery Services	XLI - Industrials
UGI Corporation (UGI)	Natural Gas Distribution	XLU - Utilities

We need to determine how to allocate our client's money to each of the candidate stocks. Let's take a look at how these stocks have performed over the last 10 years.
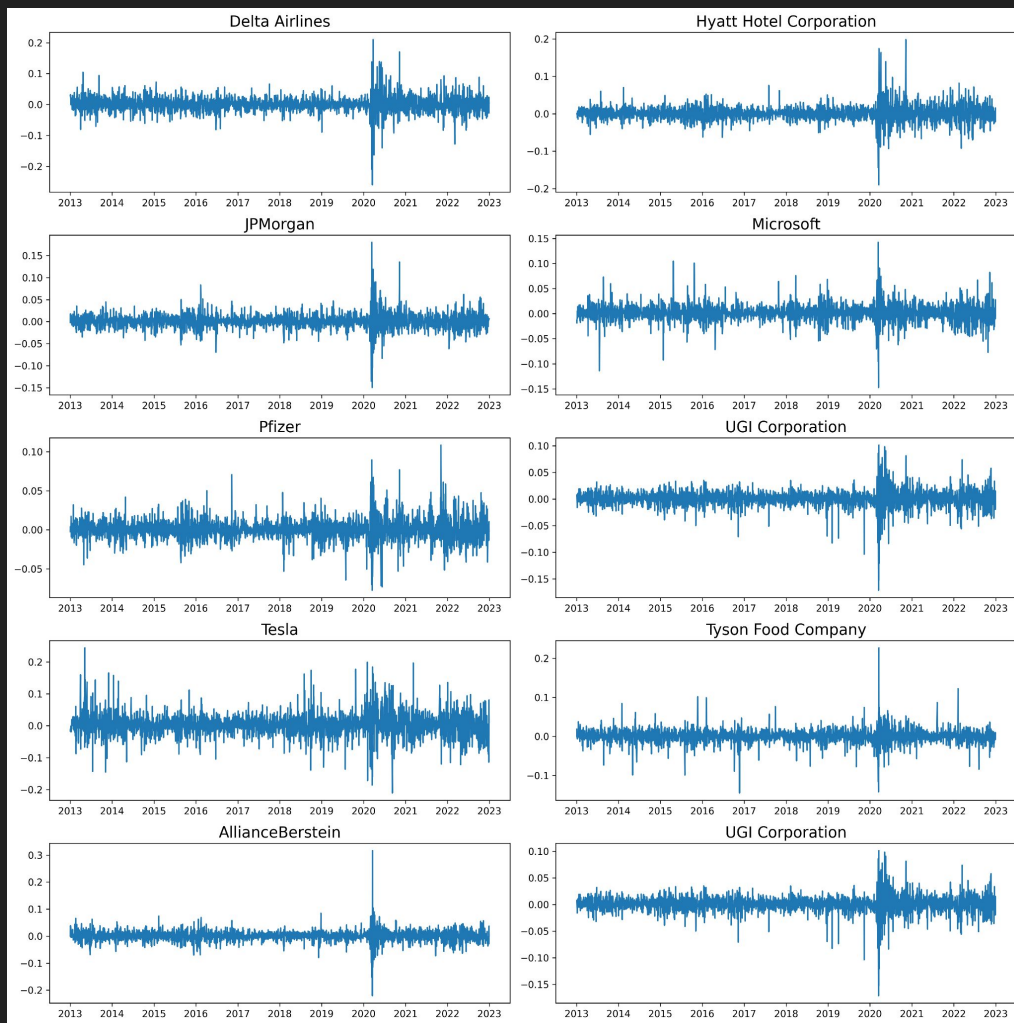
Adjusted Closing Price Over Last 10 Years

Candidate Assets Adjusted Closing Price
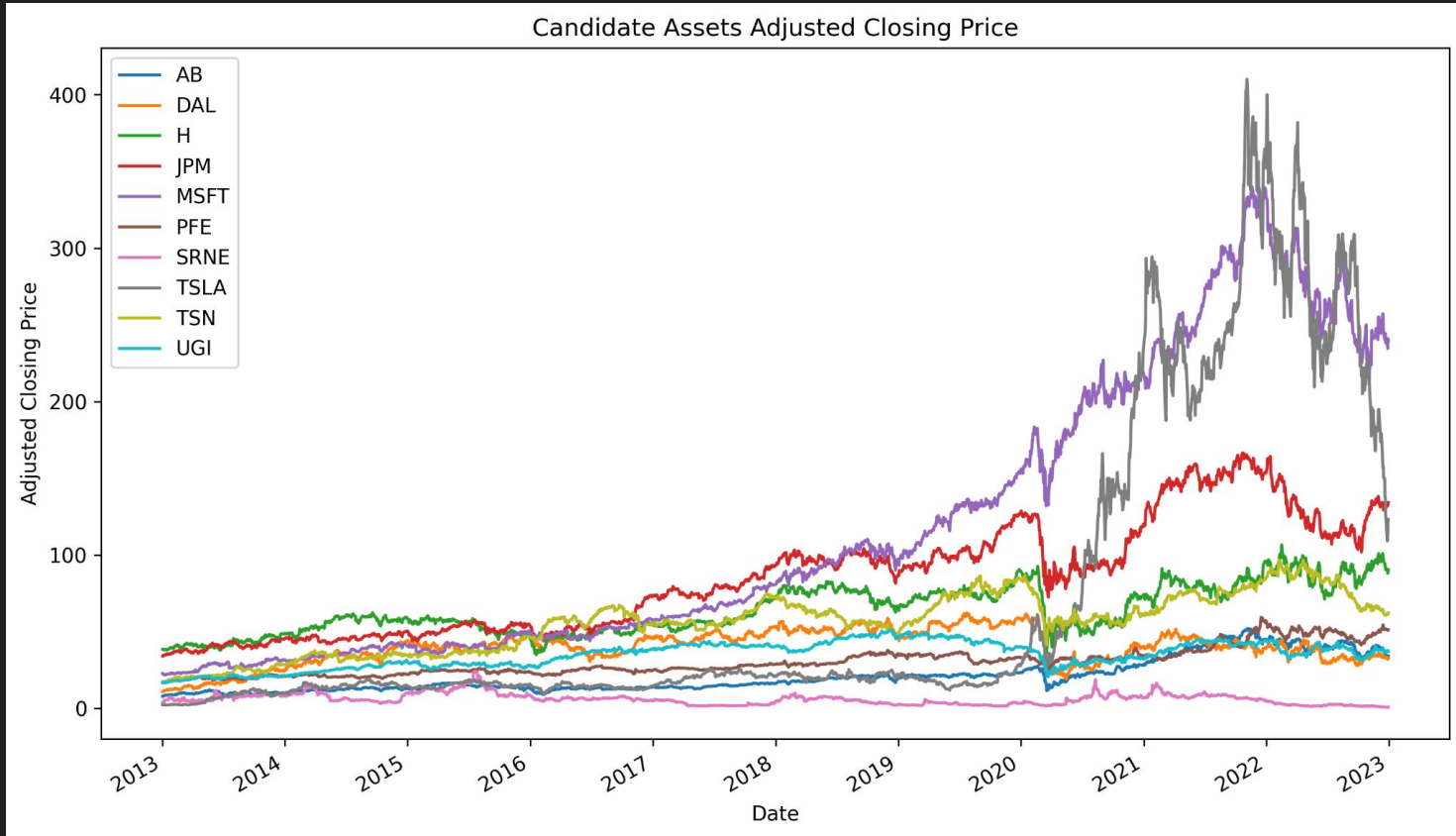
Daily Simple Rate of Return Over Last 10 Years
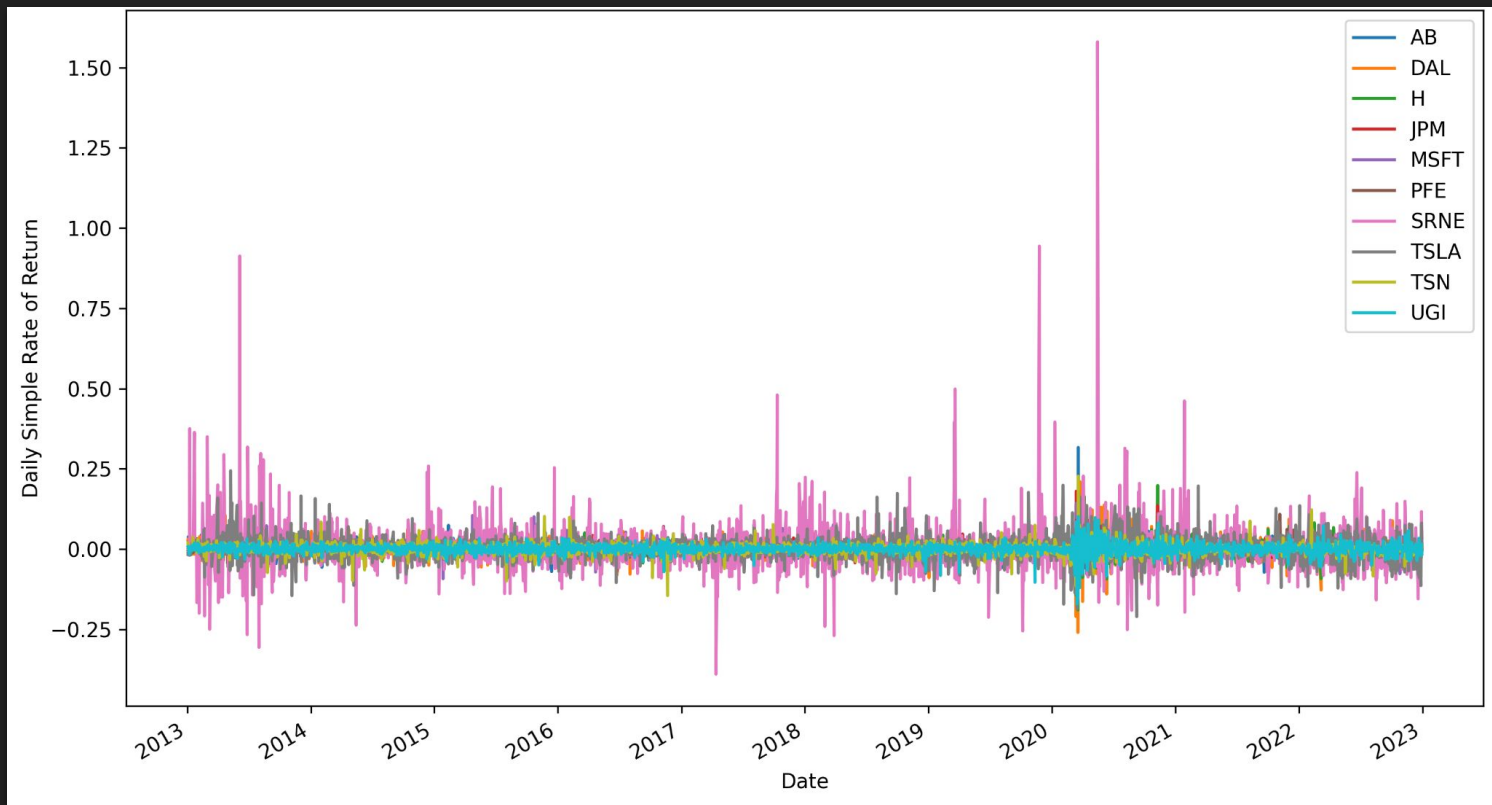
Daily Simple Rate of Return for Each Asset Over Last 10 Years

Expected Rate of Return for Candidate Stocks

Tesla (TSLA), Sorrento (SRNE), and Microsoft (MSFT) have the largest expected return.

Hyatt Hotels (H), Pfizer (PFE), and UGI Corp (UGI) have the lowest expected return.

Expected Rate of Return for Candidate Stocks
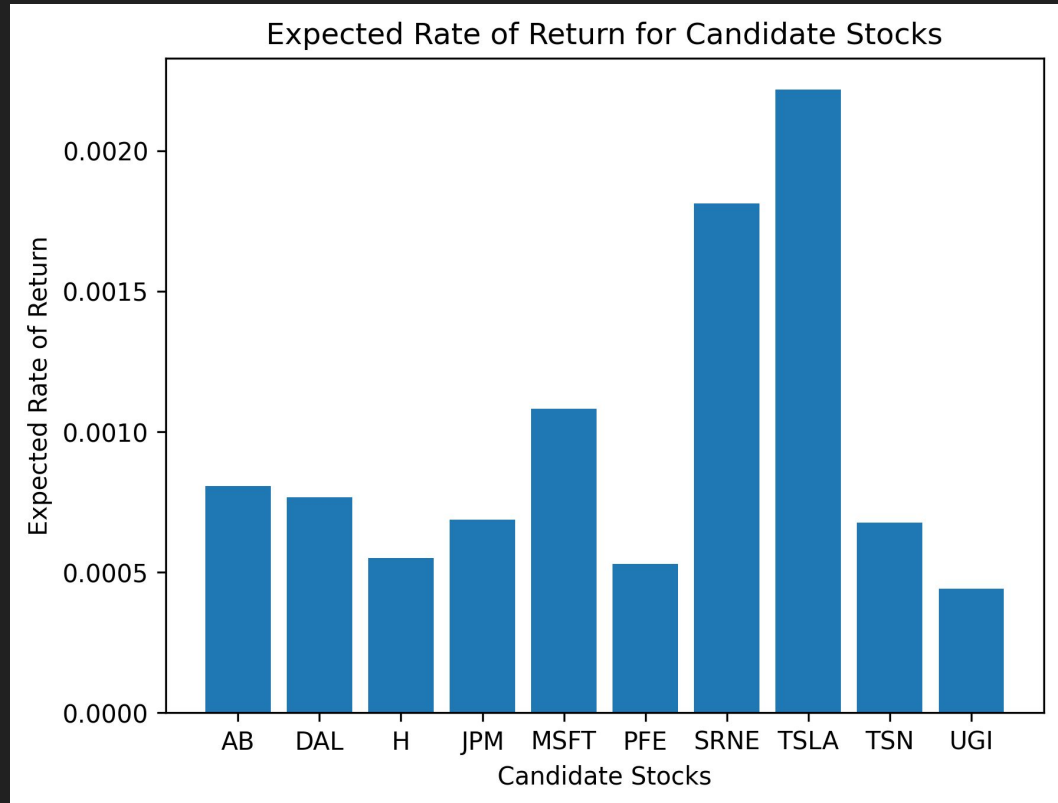
Variance of Candidate Stocks

Variance is used to indicate risk.

Sorrento (SRNE) has a much larger variance than all other stocks.

Pfizer (PFE) has the lowest variance.
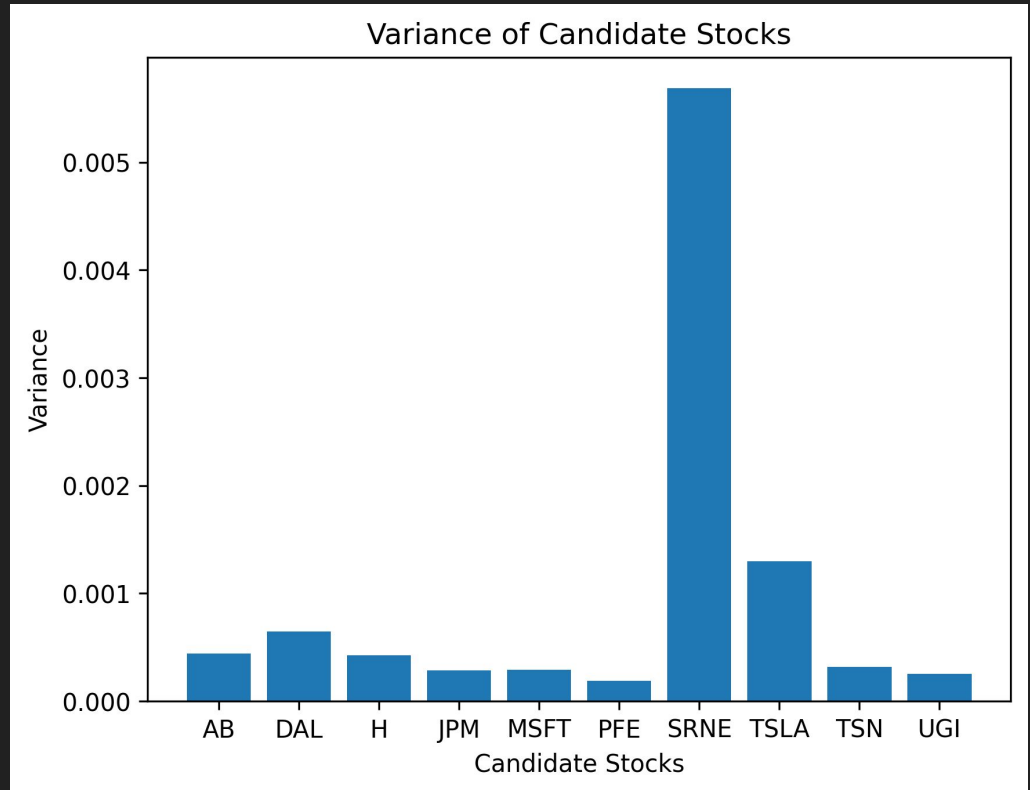
Standard Deviation of Each Candidate Stock

Standard Deviation is the square root of the variance - making the value easier to understand since the units are constant with the original data.

As you can see, Sorrento (SRNE) and Pfizer (PFE) still have the highest and lowest variance, respectively.

Correlation between Candidate Stocks

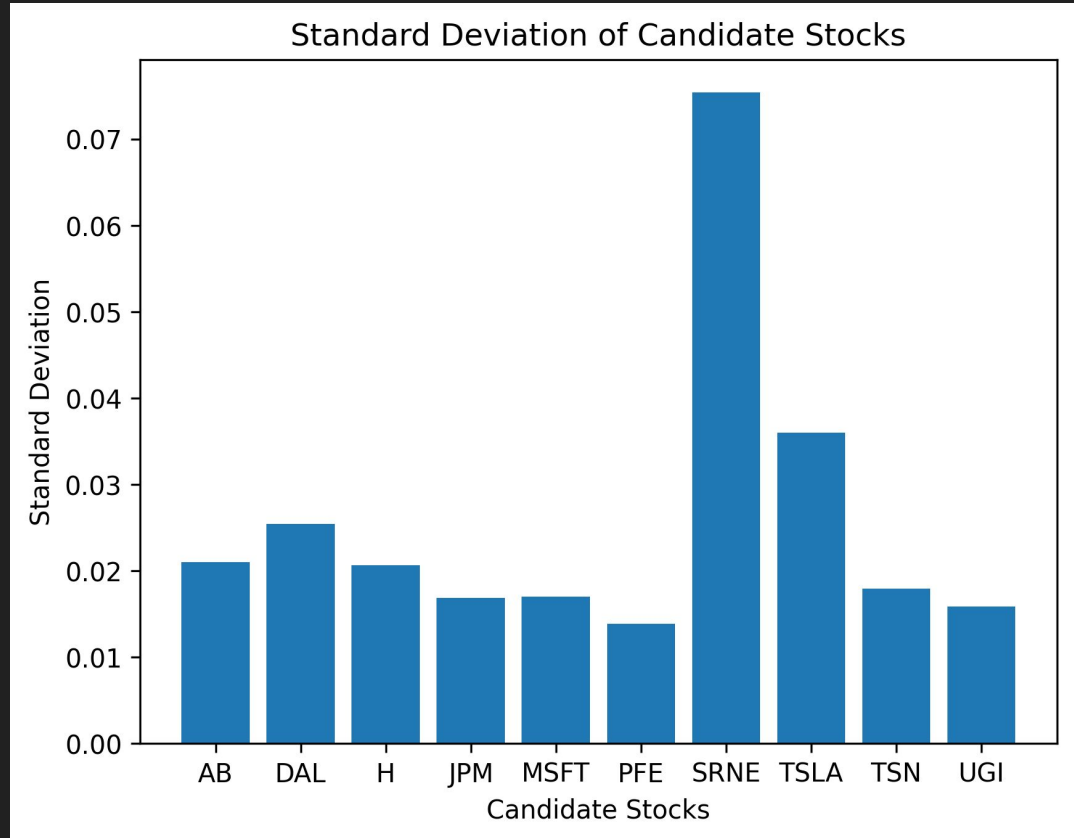|	AB	DAL	H	JPM	MSFT	PFE	SRNE	TSLA	TSN	UGI
AB	1.00000	0.41709	0.45352	0.54789	0.42552	0.27055	0.09930	0.31167	0.33983	0.48318
DAL	0.41709	1.00000	0.61734	0.55880	0.32156	0.24950	0.09166	0.25014	0.30185	0.38394
H	0.45352	0.61734	1.00000	0.54230	0.35932	0.21009	0.10373	0.27904	0.33897	0.42331
JPM	0.54789	0.55880	0.54230	1.00000	0.47315	0.41009	0.08431	0.24472	0.34498	0.48720
MSFT	0.42552	0.32156	0.35932	0.47315	1.00000	0.36158	0.16874	0.37545	0.25548	0.33726
PFE	0.27055	0.24950	0.21009	0.41009	0.36158	1.00000	0.09890	0.13233	0.20389	0.29146
SRNE	0.09930	0.09166	0.10373	0.08431	0.16874	0.09890	1.00000	0.14630	0.07894	0.06788
TSLA	0.31167	0.25014	0.27904	0.24472	0.37545	0.13233	0.14630	1.00000	0.15309	0.16878
TSN	0.33983	0.30185	0.33897	0.34498	0.25548	0.20389	0.07894	0.15309	1.00000	0.34926
UGI	0.48318	0.38394	0.42331	0.48720	0.33726	0.29146	0.06788	0.16878	0.34926	1.00000

Covariance Between Stocks

	AB	DAL	H	JPM	MSFT	PFE	SRNE	TSLA	TSN	UGI
AB	0.00044	0.00022	0.00020	0.00019	0.00015	0.00008	0.00016	0.00024	0.00013	0.00016
DAL	0.00022	0.00065	0.00032	0.00024	0.00014	0.00009	0.00018	0.00023	0.00014	0.00016
H	0.00020	0.00032	0.00043	0.00019	0.00013	0.00006	0.00016	0.00021	0.00013	0.00014
JPM	0.00019	0.00024	0.00019	0.00029	0.00014	0.00010	0.00011	0.00015	0.00010	0.00013
MSFT	0.00015	0.00014	0.00013	0.00014	0.00029	0.00009	0.00022	0.00023	0.00008	0.00009
PFE	0.00008	0.00009	0.00006	0.00010	0.00009	0.00019	0.00010	0.00007	0.00005	0.00006
SRNE	0.00016	0.00018	0.00016	0.00011	0.00022	0.00010	0.00569	0.00040	0.00011	0.00008
TSLA	0.00024	0.00023	0.00021	0.00015	0.00023	0.00007	0.00040	0.00130	0.00010	0.00010
TSN	0.00013	0.00014	0.00013	0.00010	0.00008	0.00005	0.00011	0.00010	0.00032	0.00010
UGI	0.00016	0.00016	0.00014	0.00013	0.00009	0.00006	0.00008	0.00010	0.00010	0.00025

Covariance Heat Map

Sorrento (SRNE) and Tesla (TSLA) have the highest covariance, meaning they respond similarly to market forces.

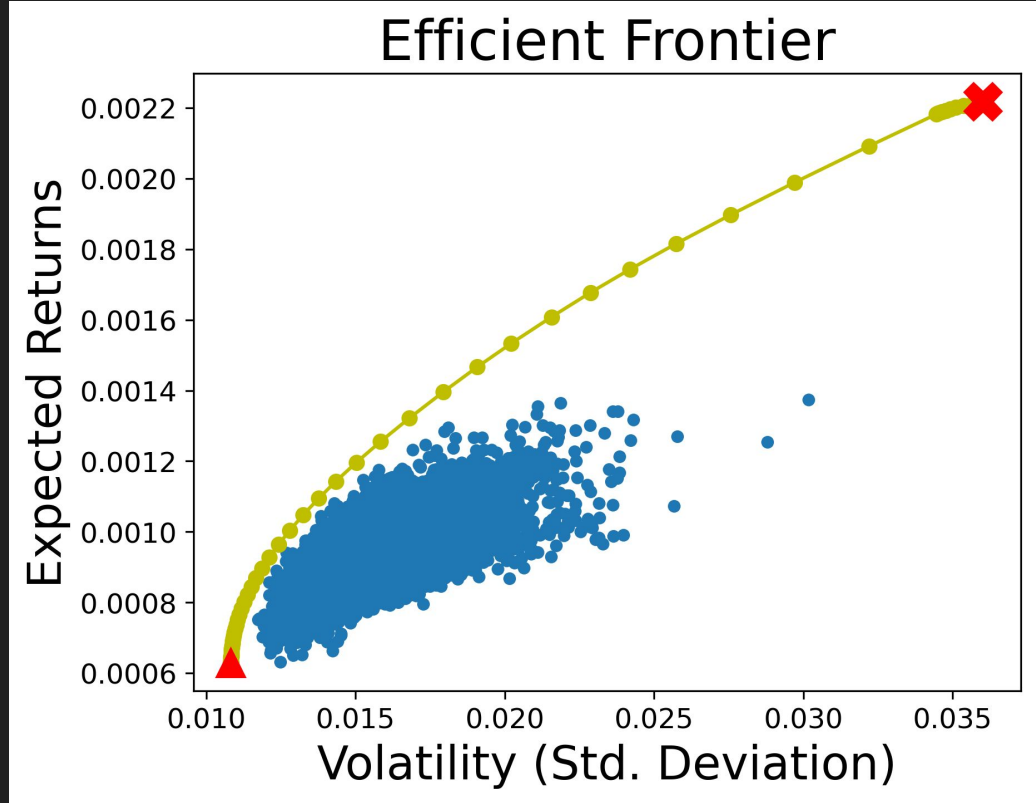Hyatt (H) and Delta Air Lines (DAL) have next highest covariance.

To minimize risk, you want to minimize covariance.

Covariance Heatmap
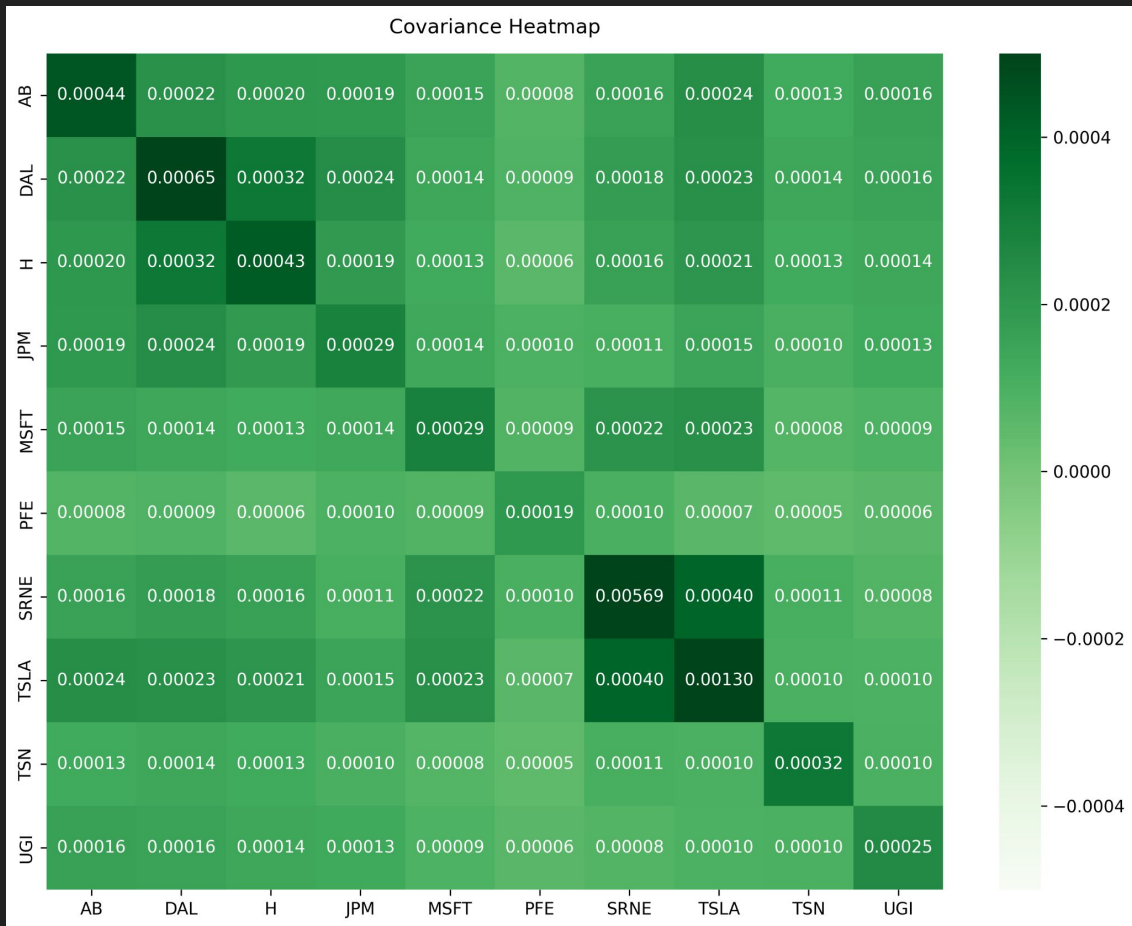
Efficient Frontier

Red triangle marks the portfolio with the lowest risk

Red X marks the portfolio with the highest return

Portfolio Options

Depending on the client's risk aversion, you would want to pick a different portfolio along the efficient frontier. Here some examples of portfolios the client could choose from.

	Maximum Return	Median Return	Median Risk	Minimum Risk
Returns	0.00140	0.00096	0.00110	0.00064
Volatility	0.02590	0.02024	0.01556	0.01140
AB Weight	0.02755	0.04828	0.16968	0.03528
DAL Weight	0.03282	0.07579	0.01781	0.00593
H Weight	0.06907	0.13931	0.03080	0.05702
JPM Weight	0.00909	0.07797	0.08628	0.11416
MSFT Weight	0.00795	0.13828	0.17433	0.01085
PFE Weight	0.04235	0.13433	0.02164	0.29324
SRNE Weight	0.26735	0.21597	0.07716	0.01560
TSLA Weight	0.28945	0.00571	0.18153	0.01590
TSN Weight	0.14389	0.13768	0.11694	0.29174
UGI Weight	0.11047	0.02668	0.12383	0.16027