The Laboratory Letters
- A Data-Driven Portfolio -

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Abstract

Hello and welcome to the Laboratory Letters. Here we will look at economic conditions quarterly and stock picks monthly. I hope to utilize this as both a way to express my opinion, delve deeper into topics that interest me, and also distribute them out into the world for as many (or as few) to hear.

This is a data-driven portfolio. Today's agenda is to go over definitions in each: the Efficient Frontier for Modern Portfolio Theory, performance projection, and portfolio allocation.

If you would like to see previous newsletters or view the rest of the blog outside of the Laboratory Letters, please visit my website at DCNeLabs.io!

Thank you!

Contents

1 Whats New?

From now on 10% of the portfolio will be iShares Treasury Bonds.

The portfolio allocation will happen twice a month. Follow the website to keep up to date! Please read the charts and the graph with their corresponding date ranges.

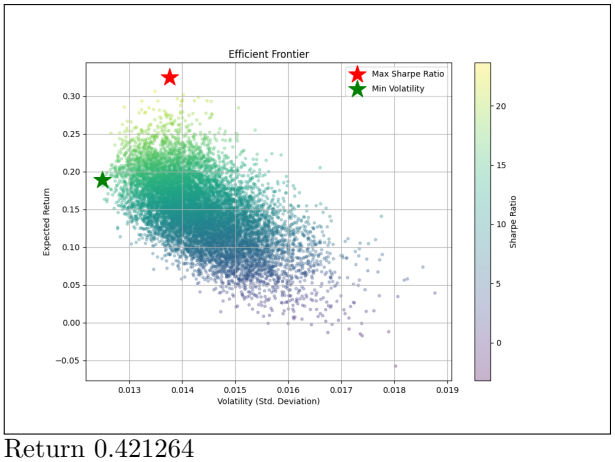
2 Portfolio

2.1 Efficient Frontier for Modern Portfolio Theory

Definitions List

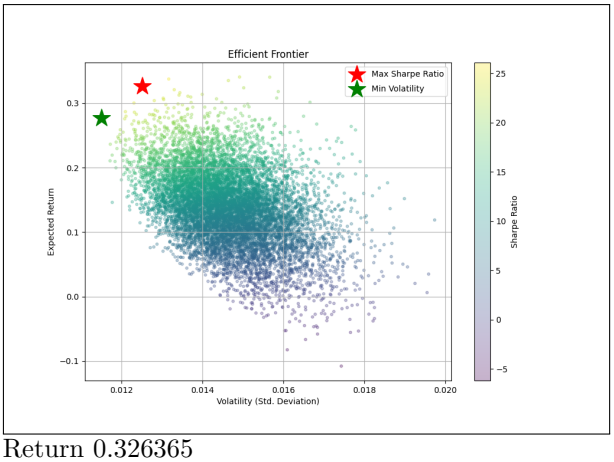
1. Modern Portfolio Theory (MPT): A framework for constructing investment portfolios to maximize expected return based on a given level of market risk, emphasizing diversification.
2. Expected Return: The anticipated return on an investment portfolio, typically expressed as a percentage.
3. Volatility (Standard Deviation): A statistical measure of the dispersion of returns for a given portfolio, representing the degree of variation or risk.
4. Scatter Plot: A type of data visualization that displays values for typically two variables for a set of data, with each point representing a portfolio.
5. Sharpe Ratio: A measure of risk-adjusted return, calculated as the difference between the portfolio return and the risk-free rate, divided by the standard deviation of the portfolio return.
6. Max Sharpe Ratio (Red Star): The portfolio on the Efficient Frontier that has the highest Sharpe Ratio, indicating the best risk-adjusted return. It combines the highest expected return with the lowest possible risk.
7. Min Volatility (Green Star): The portfolio on the Efficient Frontier with the lowest volatility, making it ideal for risk-averse investors. This portfolio offers the most stability but not necessarily the highest return.
8. Gradient (Green to Yellow): A visual representation on the plot that shows increasing Sharpe Ratios, indicating portfolios that balance expected returns and risk more efficiently.
9. Risk-Adjusted Return: The return on an investment after taking into account the risk involved in producing that return.
10. Performance Projection: An analysis or forecast of future performance, in this context, using a Python script to predict stock returns for the next month.
11. Random Forest Regression Model: A machine learning model that uses multiple decision trees to predict a continuous outcome, such as stock returns, by averaging the results.
12. Valuation Measures: Financial metrics used to assess the value and performance of a stock, such as P/E ratio, market cap, and dividend yield.
13. Training and Testing Sets: Subsets of a dataset used to train a machine learning model (training set) and evaluate its performance (testing set).
14. Mean Squared Error (MSE): A measure used to evaluate the accuracy of a regression model, calculated as the average of the squares of the errors between predicted and actual values.

July 15-31



Return 0.421264
Volatility 0.013248
Sharpe Ratio 31.797608

August 1-15



Return 0.326365
Volatility 0.012515
Sharpe Ratio 26.077430

2.2 Performance Projection

Definitions List

1. Financial Metrics: Quantitative measures used to assess the financial performance of a company, such as revenue, earnings, and valuation ratios.
2. Random Forest Regression Model: A machine learning model that uses multiple decision trees to predict a continuous outcome, by averaging the results of the trees to improve accuracy.
3. Dataset: A collection of data points or values used for analysis and model training.
4. yfinance: A Python library used to fetch historical market data from Yahoo Finance.
5. Valuation Measures: Financial metrics used to determine the value and performance of a stock, such as price-to-earnings (P/E) ratio, market capitalization, and dividend yield.
6. Relevant Features: The most important variables or predictors selected for use in a machine learning model.
7. Training and Testing Sets: Subsets of a dataset where the training set is used to train the machine learning model, and the testing set is used to evaluate the model's performance.
8. Mean Squared Error (MSE): A metric used to evaluate the accuracy of a regression model, calculated as the average of the squared differences between predicted and actual values.
9. Predictions: The output values generated by the machine learning model, representing the expected future values based on the input data.
10. Top 10 Stocks: The stocks that are predicted to have the highest returns for the next month based on the model's predictions.
11. Actionable Insights: Practical and useful information derived from data analysis that can inform decision-making.
12. Stock Performance: The measurement of how a stock behaves in terms of price changes and returns over a specific period.

July 15-31

Stock	Name	Performance Projection %
CARR	Carrier Global Corp	09.46
CTRA	Coterra Energy Inc	09.29
JBHT	J B Hunt Transport Services Inc	09.77
ORCL	Oracle Corp	12.78
PARA	Paramount Global Class B	20.04
PHM	PulteGroup, Inc.	13.76
POOL	Pool Corp	09.29
PWR	Quanta Services Inc	10.73
TGT	Target Corp	10.49
TPR	Tapestry Inc	11.64

August 1-15

Stock	Name	Performance Projection %
AAL	American Airlines Group Inc	08.56
ALB	Albemarle Corporation	08.34
AVGO	Broadcom Inc	08.43
BEN	Franklin Resources Inc	08.68
CCL	Carnival Corp	07.59
CEG	Constellation Energy Corp	10.08
COP	ConocoPhillips	07.56
F	Ford Motor Co	13.23
LLY	Eli Lilly And Co	07.78
NWS	News Corp Class B	19.47

2.3 Stock Allocation

Definitions List

1. Sharpe Ratio: A measure of risk-adjusted return, calculated as the difference between the portfolio return and the risk-free rate, divided by the standard deviation of the portfolio return.
2. Minimum Volatility: The lowest level of price fluctuation for a portfolio, indicating lower risk.
3. yfinance: A Python library used to fetch historical market data from Yahoo Finance.
4. Adjusted Closing Prices: Stock prices that have been modified to include dividends, stock splits, and other corporate actions, providing a more accurate reflection of the stock's value.
5. Log Returns: The logarithm of the ratio of the current price to the previous price, used to measure continuous compounding returns of each stock.
6. Covariance Matrix: A matrix that contains the covariances between pairs of variables (e.g., stock returns), used to understand the variance and correlation between stock returns.
7. Variance: A measure of how much the values of a variable differ from the mean of that variable.
8. Correlation: A statistical measure that describes the extent to which two variables move in relation to each other.
9. Portfolio Optimization: The process of selecting the best portfolio out of the set of all possible portfolios, according to some objective, such as maximizing the Sharpe Ratio or minimizing risk.
10. Annualized Returns: The mean of the log returns multiplied by the number of trading days in a year (typically 250), used to estimate yearly returns.
11. Random Portfolios: Portfolios generated with randomly assigned weights to stocks, used to find the optimal portfolio based on specific criteria.
12. Weights: The proportion of each stock in a portfolio, normalized to ensure they sum up to 1.

13. Expected Return: The anticipated return on an investment portfolio, typically expressed as a percentage.

14. Standard Deviation (Volatility): A statistical measure of the dispersion of returns for a given portfolio, representing the degree of variation or risk.

15. generate_portfolios Function: A function defined in the script to create a specified number of random portfolios, each with randomly assigned weights to the stocks, and calculate their expected returns, standard deviations, and Sharpe Ratios.

16. DataFrame: A two-dimensional, size-mutable, and potentially heterogeneous tabular data structure with labeled axes (rows and columns) in pandas.

17. Optimal Portfolios: Portfolios that are identified as the most efficient based on specific criteria, such as the highest Sharpe Ratio or lowest volatility.

18. Statistical Analysis: The process of collecting and analyzing data to identify patterns and trends.

19. Historical Stock Data: Past price and volume information for stocks, used to inform investment decisions and predict future performance.

Allocations:

July 15-31

Stock	Name	Allocation %
CARR	Carrier Global Corp	10.59
CTRA	Coterra Energy Inc	01.71
JBHT	J B Hunt Transport Services Inc	08.50
ORCL	Oracle Corp	17.23
PARA	Paramount Global Class B	01.44
PHM	PulteGroup, Inc.	26.57
POOL	Pool Corp	00.38
PWR	Quanta Services Inc	24.74
TGT	Target Corp	07.23
TPR	Tapestry Inc	01.56

August 1-15

Stock	Name	Allocation %
AAL	American Airlines Group Inc	02.58
ALB	Albemarle Corporation	00.11
AVGO	Broadcom Inc	14.88
BEN	Franklin Resources Inc	06.84
CCL	Carnival Corp	03.10
CEG	Constellation Energy Corp	19.56
COP	ConocoPhillips	04.53
F	Ford Motor Co	03.74
LLY	Eli Lilly And Co	16.92
NWS	News Corp Class B	17.68
GOVT	iShares Treasury Bond	10.00

3 Last Month's Results

First Half of the Month

Stock	Weight %	Start price	End price	Change %	Dividend Value
1. Apple Inc	10.00	212.09	230.54	08.69	0
2. Coterra Energy Inc	14.42	26.83	27.1	01.00	0
3. Eastman Chemical Co	19.35	98.2	98.64	00.44	15.96
4. NetApp Inc	08.64	129.46	130.17	00.54	0
5. Oracle Corp	00.40	141.69	144.77	02.17	0
6. Paramount Global Class B	14.00	10.39	11.56	11.26	6.73
7. Quanta Services Inc	00.41	255.96	268.81	05.02	0.01
8. Ralph Lauren Corp	00.39	175.65	181.58	03.37	0.18
9. Vistra Corp	19.38	88.74	91.33	02.91	0
10. Exxon Mobil Corp	09.68	115.71	113.27	-02.10	0
SPDR S&P 500 ETF Trust	100	545.63	559.99	02.63	0

Second Half of the Month

Stock	Weight %	Start price	End price	Change %	Dividend Value
1. Carrier Global Corp	10.59	67.25	68.11	01.27	0
2. Coterra Energy Inc	01.71	27.19	25.8	-05.11	0
3. J B Hunt Transport Services Inc	08.50	166.36	173.11	04.05	0
4. Oracle Corp	17.23	145.73	139.45	-04.30	0
5. Paramount Global Class B	01.44	11.63	11.42	-01.80	0
6. PulteGroup, Inc.	26.57	116.85	132	12.96	0
7. Pool Corp	00.38	329.14	374.04	13.64	0
8. Quanta Services Inc	24.74	266.78	265.38	-00.52	0
9. Target Corp	07.23	152.85	150.41	-01.59	0
10. Tapestry Inc	01.56	43.56	40.09	-07.96	0
SPDR S&P 500 ETF Trust	100	562.03	550.81	-01.99	0

First Half of the Month

Portfolio:	Monthly Returns: 3.36%	Yearly Returns: 3.36%
SNP 500:	Monthly Returns: 2.63%	Yearly Returns: 2.63%

Difference: 0.73% Compared to SNP. YAY!!!

Second Half of Month

Portfolio:	Monthly Returns: 2.75%	Yearly Returns: 6.20%
SNP 500:	Monthly Returns: -2.00%	Yearly Returns: 0.58%

Difference: 5.62% Compared to SNP. EVEN BETTER!!!

If you would like to follow this portfolio's performance on the day-to-day, please go to my portfolio tracker on my website.

4 Disclaimer

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