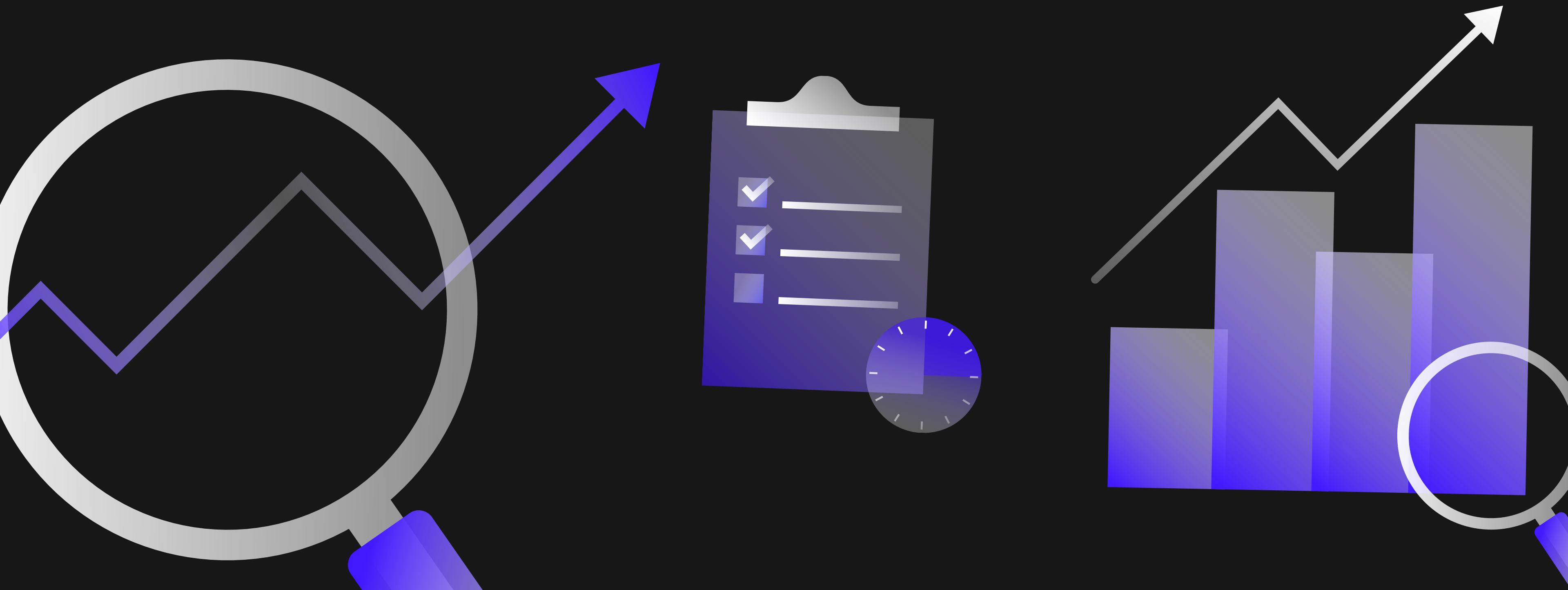


Analyzing Risks and
Returns of

Stock Portfolio

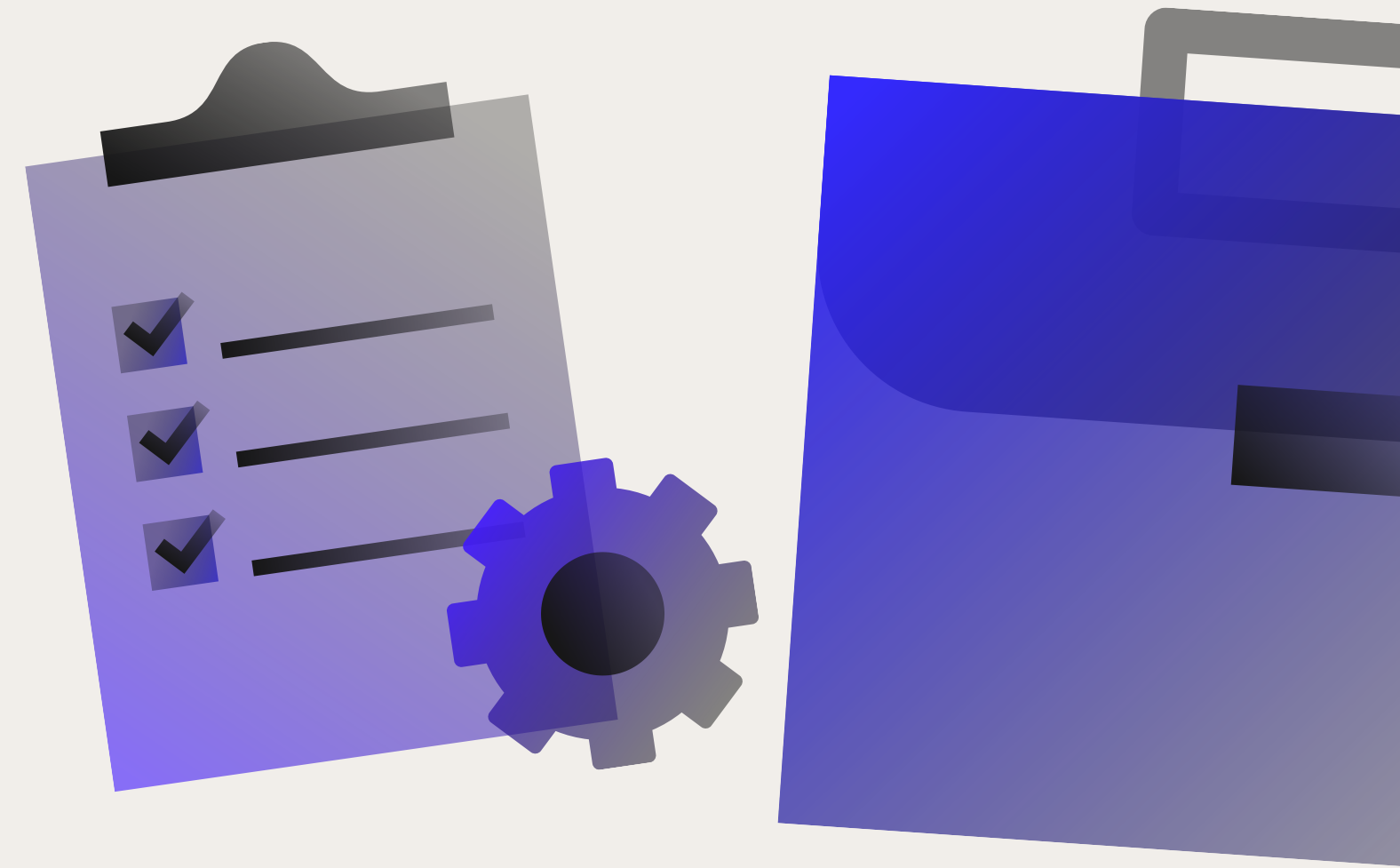


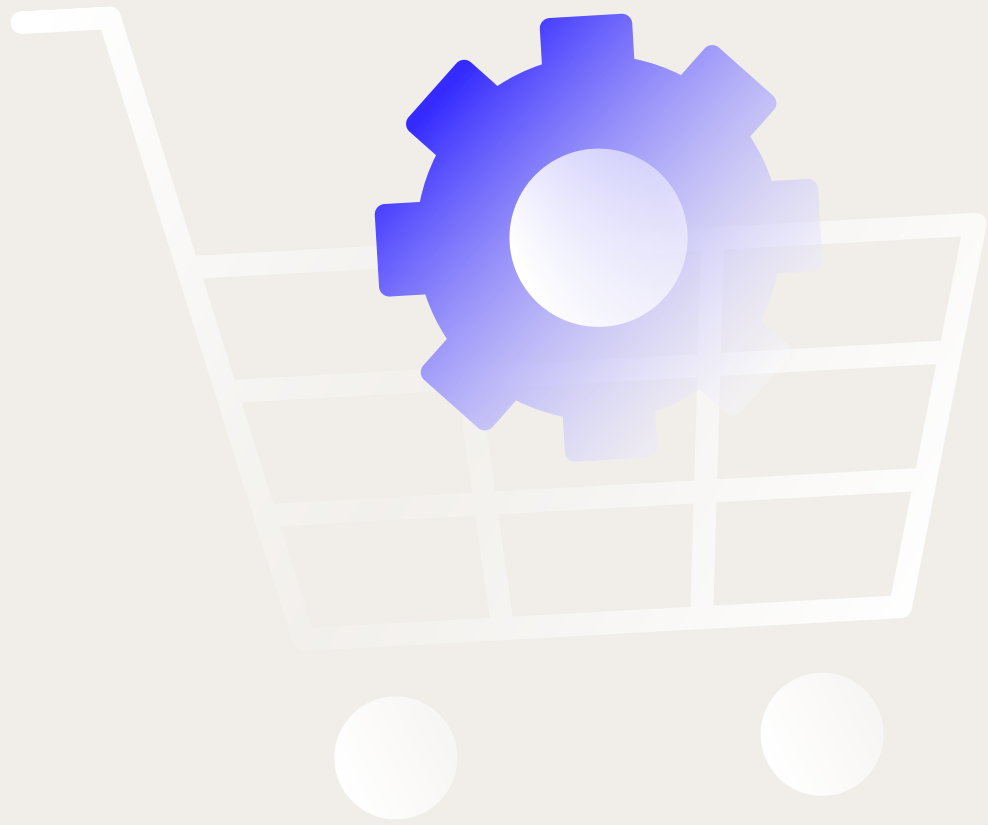
Overview

Asset allocation is a crucial decision every investor must make, involving how to distribute their capital across various assets—in this case, stocks. When determining allocations, investors aim to balance potential returns against associated risks, influenced by their personal goals, risk tolerance, and time horizons.

A widely-used approach to asset allocation is Modern Portfolio Theory (MPT), developed by Nobel laureate Harry Markowitz. MPT provides a framework for constructing portfolios to maximize expected returns at a given risk level or, alternatively, to minimize risk for a targeted return. This approach relies on a mathematical technique known as mean-variance optimization.

The core insight of MPT is that an asset should not be assessed in isolation; rather, investors should evaluate its impact on the overall portfolio. Another essential concept is diversification—holding a variety of assets to spread risk. This way, gains or losses from one security have less influence on the portfolio as a whole.

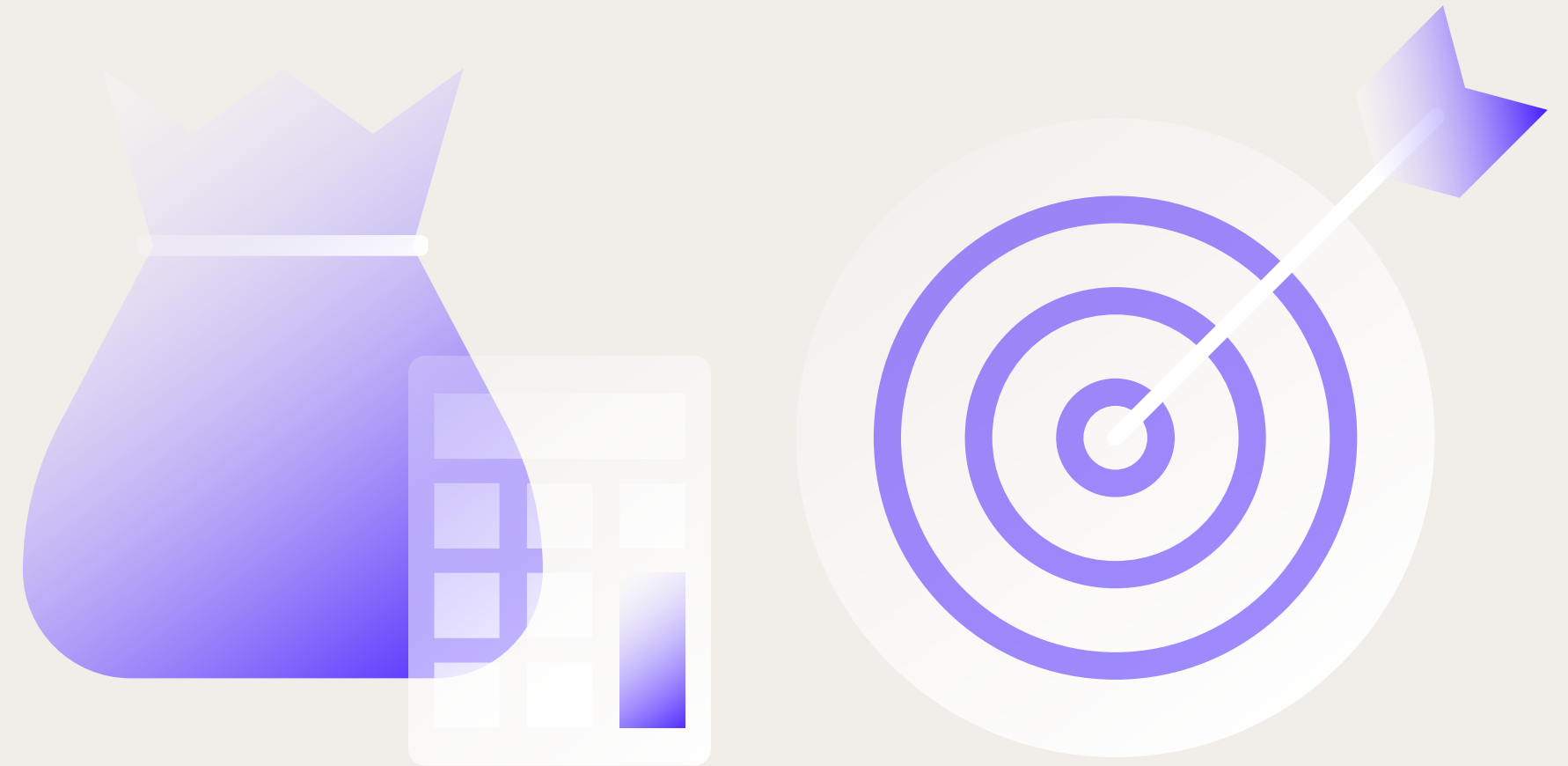




Problem Statements

The project deals with portfolio optimization for a set of FAANG stocks (Facebook, Apple, Amazon, Netflix, and Google). The goal is to find the optimal allocation of investment capital across these stocks to achieve a desired level of risk and return.

Goals



- **Benchmark 1/n Portfolio:** Calculate the performance of a simple, equally weighted ($1/n$) portfolio across all FAANG stocks.
- **Minimize Portfolio Volatility:** Identify the portfolio weights that minimize overall risk (volatility) while maintaining a reasonable level of return.
- **Maximize Sharpe Ratio:** Find the portfolio weights that maximize the Sharpe ratio, which measures risk-adjusted return.



The code utilizes a CSV file named "faang_stocks.csv" containing historical daily stock prices for the FAANG companies. The specific source of this data is not explicitly mentioned in the code.



Dataset and Source

Outputs

Creating an efficient portfolio of FAANG stocks—Facebook (Meta), Apple, Amazon, Netflix, and Google. Your objective is to maximize returns while managing risk effectively. In this project, determine the optimal allocation of `FAANG stocks` using historical price data from 2020 to 2023. The dataset, stored in `stocks.csv`, includes the daily closing prices for these five tech giants.

The project performs the following financial analysis :

- **Expected Returns and Annualized Sharpe Ratio for an Equally-Weighted Portfolio.** Calculate the expected returns and annualized Sharpe ratio of an equally-weighted portfolio, assuming a risk-free rate of 0%. Store the expected return as a float variable named `benchmark_exp_return` and the Sharpe ratio as `benchmark_sharpe_ratio`.
- **Minimum Volatility Portfolio.** Using mean-variance optimization, find the portfolio that minimizes volatility. Store the volatility of this portfolio as a float variable called `mv_portfolio_vol` and the corresponding portfolio weights as a `pandas` Series named `mv_portfolio`, with the tickers as the index.
- **Maximum Sharpe Ratio Portfolio.** Using mean-variance optimization and a risk-free rate of 0%, determine the portfolio that maximizes the Sharpe ratio. Store the annualized Sharpe ratio of this portfolio as a float variable called `ms_portfolio_sharpe` and the portfolio weights as a `pandas` Series named `ms_portfolio`, using tickers as the index.

Data Findings

This table presents the historical daily stock prices for the five FAANG companies (Facebook, Apple, Amazon, Netflix, and Google) from January 2, 2020, to December 29, 2023.

Date: The first column represents the date for which the stock prices are recorded.

Stock Prices: Each subsequent column corresponds to a specific FAANG company and shows its closing price on the respective date.

	AAPL	AMZN	GOOGL	META	NFLX
Date					
2020-01-02	75.09	94.90	68.43	209.78	329.81
2020-01-03	74.36	93.75	68.08	208.67	325.90
2020-01-06	74.95	95.14	69.89	212.60	335.83
2020-01-07	74.60	95.34	69.76	213.06	330.75
2020-01-08	75.80	94.60	70.25	215.22	339.26
...
2023-12-22	193.60	153.42	141.49	353.39	486.76
2023-12-26	193.05	153.41	141.52	354.83	491.19
2023-12-27	193.15	153.34	140.37	357.83	491.79
2023-12-28	193.58	153.38	140.23	358.32	490.51
2023-12-29	192.53	151.94	139.69	353.96	486.88
1006 rows × 5 columns					

Data Findings

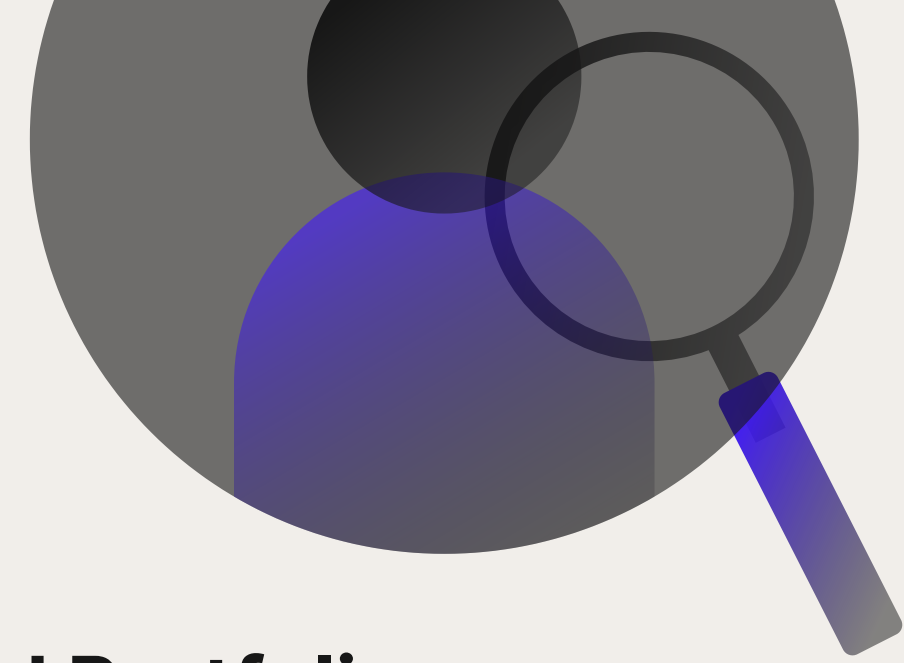
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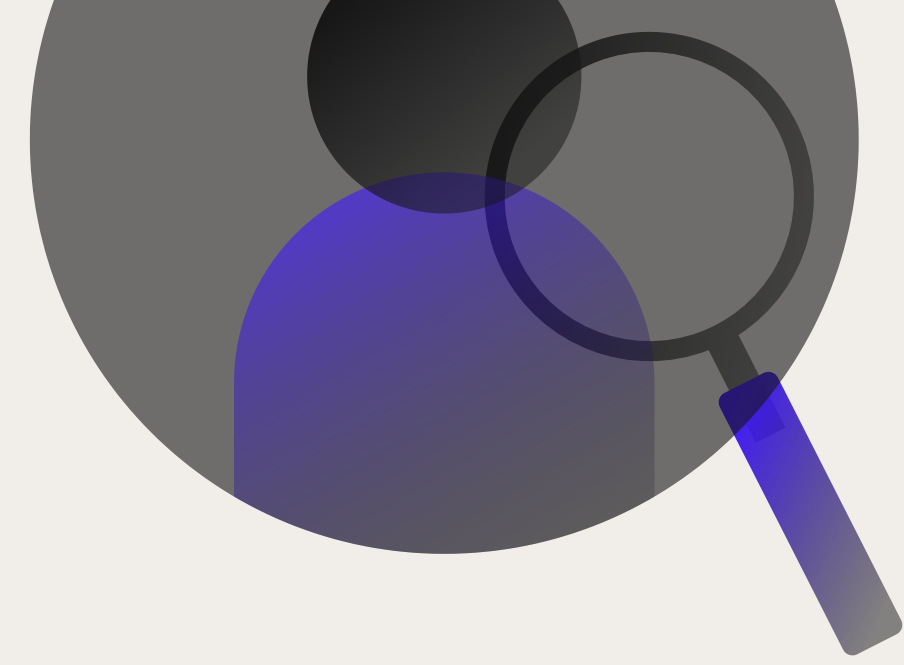
Data Findings



Expected Returns and Annualized Sharpe Ratio for an Equally-Weighted Portfolio.

- Expected Returns Sharpe Ratio : 0.0009366970530650012
 - This represents the average return that an investor can anticipate from the portfolio over a specific period, in this case, annualized.
 - A positive expected return indicates that, on average, the portfolio is expected to grow over time.
- Annualized Sharpe Ratio : 0.7221868020795013
 - The Sharpe ratio is a measure of risk-adjusted return. It compares the excess return of an investment to its volatility.
 - A higher Sharpe ratio indicates better risk-adjusted performance.
 - In this case, a Sharpe ratio of 0.7221868020795013 suggests that the portfolio has a relatively high risk-adjusted return.

Data Findings



Minimum Volatility Portfolio : 0.3030736711547463

- This portfolio is constructed to minimize the overall risk (volatility) while still generating a reasonable return.
- A minimum volatility portfolio is suitable for investors who prioritize risk reduction over high returns.

Maximum Sharpe Ratio Portfolio : 0.8821809421501468

- This portfolio aims to maximize the Sharpe ratio, which means it seeks to achieve the highest possible return for a given level of risk.
- This portfolio is suitable for investors who are willing to take on more risk in exchange for higher potential returns.

Insights

The code helps compare the performance of different portfolio allocation strategies.

By analyzing the Sharpe ratio, you can assess the trade-off between risk and return for each portfolio.

