ETF Analyzation FinTech Bootcamp Project 1

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Project Contributors

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Project Overview

- Select Exchange Traded Funds (ETFs) to analyze daily return data
- Import and Read in necessary libraries and API keys from Alpaca to get necessary information for selected ETFs
- Graph daily returns comparing the ETFs against one another to show which sector had the greatest volitality
- Run Monte Carlo Simulations to include time periods prior to Covid-19 Pandemic returns to illustrate projections of returns without Covid-19 financial market conditions
- Run Monte Carlo Simulations to include Covid-19 Pandemic returns to illustrate projections with returns to include possibilities of returns produced by Covid-19 financial market conditions
- Analyze the Monte Carlo Simulations to compare the projections investing in the selected ETFs during the pre-Covid and post-Covid time periods

Questions to Guide Research and Project:

- Inevitably during the course of the project, challenges will arise, what were some of those challenges that were faced and what were the strategies used to overcome those challenges?.
- What did we expect the code and simulations to produce and what were the actual results? How did the pre Covid-19 pandemic simulations compare to the simulations that included the years of the Covid-19 pandemic?
- Which ETFs were used? Which sectors did those ETF's come from?
- Using the Empyrical library and functions, which ETF showed the greatest maximum drawdown? Which ETF utilized showed the most exposure to risk according to the sharpe ratio function?

Answers Obtained from Research and Project: Challenges Faced and Solutions

- Challenges Faced During Project
  - Env files not being loaded and pulling the API keys to obtain data.
  - Trying to use Hv Plots without correct coding language entered
  - ReadMe file
- Strategies Used to Solve Challenges
  - While working on the code, we had a working file that used the env file to pull our API keys into the code. After saving and closing out of the code, the file was saved and sent to the group to continue working but the env file did not save properly. To solve this issue we had one group member have the file open and ran through multiple methods for pulling the API keys from the before finding the name of the file was incorrect
  - Hv Plot when the code was entered was giving an error message. We were trying to pull data from column of the correlating data frame that were not labeled. To solve we had to create dataframes for each individual ETF and the daily returns, concatenate the dataframes, and then drop the columns not needed and then use the hvplot function to create the daily return hvplot line graph.
  - ReadMe file was a portion that most of us had not dealt with before. We put a generic overview in the original file. After our presentation, we researched other ReadMe files on GitHub and worked on giving a more detailed ReadMe file to describe using the code

Answers Obtained from Research: Expectations and Actual Results

- We expected the simulations to produce the following results:
  - Pre-Covid: This was a time of unprecedented growth in the stock market and we predicted the simulations to show a consistent growth with minimal downside or decreases in returns.
  - Post-Covid: This was a time period in which Supply Chain issues disrupted the global economy, interest rates at all time lows and many other economical conditions. We expected the projections of investing in the selected ETFs would produce a wide variety of results because it is factoring in all of these market conditions.
- Actual Simulation Results:
  - Pre-Covid: The results showed that we were very close with our expectations. The Monte Carlo Simulations projected increases in returns over the 10 year period. Only one of the 10 simulations run showed a potential decrease the other 9 showed increases.
  - Post-Covid: Again this was very close to our expectations. The variability of the outcomes was much greater. There was not a consistent pattern with more potential for decreases than in the time period pre-Covid.
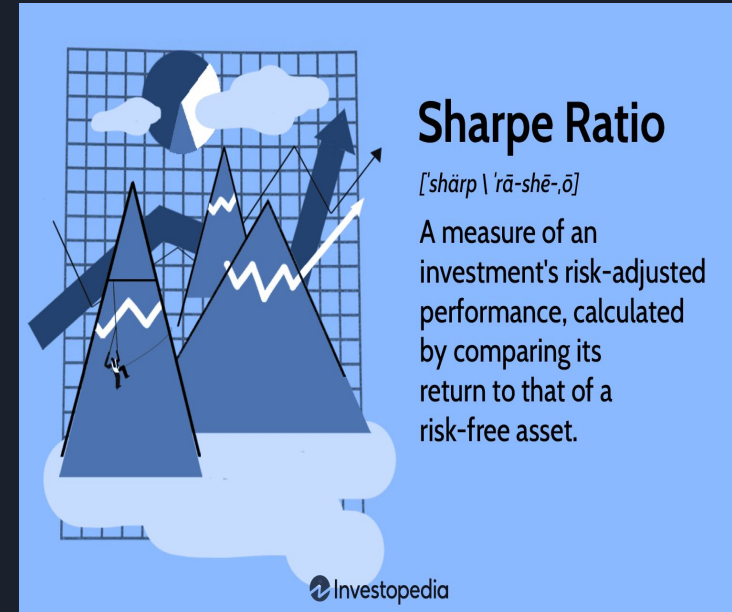
Answers From Research and Project: ETFs and Sectors used for Analyzation

- ETFs and Their Ticker Symbols Used for Analyzation and Simulation
  - SPDR S&P 500 ETF Trust - (SPY)
  - iShares Core U.S. Aggregate Bond ETF - (AGG)
  - SPDR Gold Trust - (GLD)
  - iShares Core US REIT ETF - (USRT)
- Sectors of the ETFs
  - SPY - S&P 500. ETF designed to track the S&P 500 market index and this is the oldest and largest ETF in the world today.
  - AGG - US Investment Grade Bonds. This ETF measures the performance of the U.S. investment grade bond market and the fund will invest at least 90% of its assets in Fixed Income securities.
  - GLD - This ETF denotes a fixed amount of gold bullion. GLD tracks the price to a tenth of a troy ounce of gold.
  - USRT - This ETF tracks the U.S. listed equity real estate investment trusts.

# Answers from Research and Project: Empyrical Data and Functions

- Empyrical is a Python library with performance and risk statistics commonly used in quantitative finance.
- We utilized the Empyrical python library to calculate the maximum drawdown. This was completed using command empyrical.max_drawdown(). This shows the maximum drawdown of each of the ETFs analyzed.
  - The ETF we analyzed with the largest max drawdown was the USRT (Real Estate).
- Another Empyrical function we used was the sharpe ratio calculation. The sharpe ratio compares the return of a particular investment with its risk. The greater the Sharpe Ratio the better its risk adjusted performance.
  - The riskiest ETF we used for the analyzation would be the USRT. The least risky would be the GLD.

Sharpe Ratio

[ˈshärp \ ˈrā-shē-ˌō]

A measure of an investment's risk-adjusted performance, calculated by comparing its return to that of a risk-free asset.

Investopedia

Monte Carlo Simulations Explained

- The monte carlo simulation is used to model the probability of different outcomes in a process that cannot be easily predicted due to the intervention of random variables..
- Investors and financial analysts use Monte Carlo Simulations to evaluate the probable success of investments being considered.
- The foundation of the simulation is derived from historical data, drift, standard deviation, variance and average price movement
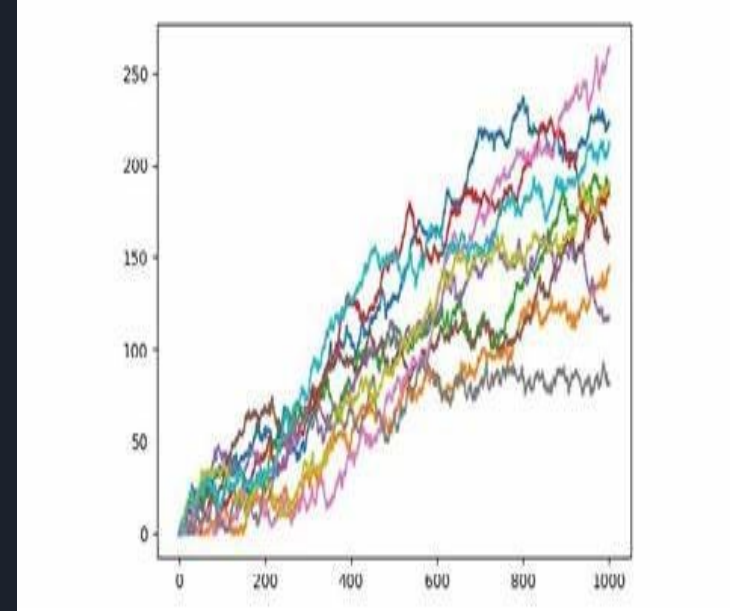
In Conclusion

After running the Monte Carlo, prior to Covid-19 Pandemic, the simulations seem to be on a steady rise and have less volatility. The trend of the success probabilities followed a consistent or increasing success rate. In the second Monte Carlo simulation that we ran comparing the success probabilities of starting the simulations to include the height of the covid pandemic and resulting inflationary period. These simulations show more volatility and a more wide spread range of returns and probabilities of potential results.

Resources

- [What is Monte Carlo Simulation? | IBM](#)
- [Exchange-Traded Fund (ETF) Explanation With Pros and Cons (investopedia.com)](#)
- UNCC FinTech Bootcamp Module 5 Activities and Challenge
- **https://pypi.org/**
- **https://alpaca.markets/**
- **JuypterLab**