

## Portfolio Analysis and Optimization

### Overview:

The code presents a comprehensive analysis of financial data and conducts portfolio optimization using Python. It utilizes Monte Carlo simulations and leverages various libraries such as Pandas, NumPy, Matplotlib, Seaborn, Plotly, and Cufflinks for data manipulation, visualization, and interactive plotting. It is part of the CFA Level 2 Python Capstone Project.

Data is taken from 01-01-2019 to 31-12-2023 (5 years)

### Data Analysis:

1. **S&P 500 Analysis:** We begin by analyzing the S&P 500 index, calculating daily returns, and visualizing the adjusted closing prices.
2. **Trend Classification:** A function classifies daily returns into categories like 'Positive Change' and 'Bull Run' based on their magnitude.
3. **Visualization:** We utilize Plotly and Matplotlib to create line plots, pie charts, candlestick charts, and other visualizations for S&P 500 data.

### Portfolio Construction:

1. **Tech Stock Portfolio:** We construct a portfolio comprising tech stocks like Amazon, Apple, Bitcoin(GBTC), Netflix, NVIDIA, Tesla, Meta, and Google.
2. **Returns and Correlations:** We calculate daily returns, plots closing prices, and analyzes correlations between stock returns.

### Results and Visualizations:

- **Monte Carlo Simulation** (*metrics of optimum portfolio after 10000 simulations*):  
Expected Annual Return = 58.50%  
Portfolio Standard Deviation (Volatility) = 40.61%  
Sharpe Ratio = 1.35
- **Efficient Frontier Plot:** Highlights the portfolio with the maximum Sharpe ratio on an interactive scatter plot. (*image attached below*)

