Equity Risk Model

Purpose

This model provides a breakdown of portfolio risk based on composition, helping assess whether current exposures align with the firm's risk appetite. It also supports decision-making around volatility management, liquidity planning, and portfolio adjustments under changing market conditions.

The final section of the model introduces comparative risk metrics by simulating the inclusion of candidate stocks, offering insight into how prospective changes in holdings may impact overall portfolio risk.

Dataset

- **Price Data:** Extracted from Yahoo Finance API (yfinance) based on daily closing prices.
- **Factor Data:** Fama-French 5-Factor data retrieved via the pandas_datareader package.
- **Time Period:** Daily data from January 2023 onward.
- **Stocks**: Selected across diverse sectors and market caps

Methodology

- **Volatility**: Standard deviation of daily returns, annualized.
- **Beta**: Calculated relative to the S&P 500 index to measure systematic risk.
- **VaR** & **CVaR**: Calculated using historical method at 95% confidence level
- **Factor Model:** Applied the **Fama-French 5-Factor Model** to analyze exposure to style risks (market, size, value, profitability, investment).
- **Stress Testing:** Custom macro scenarios applied by shocking Fama-French factors to observe portfolio impact.

Tools Used: Analysis was conducted in **Jupyter Notebook**. GenAI tools (e.g., ChatGPT) were used to assist with code implementation but not in modeling design or methodology decisions.

Key Results & Takeaways

1. **Low Overall Volatility** at **25.54%**, primarily due to concentrated exposure to **GOOGL**, which has a relatively low standalone volatility (**29.52%**).

2. **Moderate Beta** of **1.126** indicates it is above-market sensitivity against S&P 500, and generally moves in tandem with broader market direction.

3. **Relatively low VaR & CVaR** mainly driven by stable **GOOGL,** suggests a relatively low expected loss under normal market conditions.

4. **Over concentration in Communication Services** (**77.5%**).

5. **Technology sector** has the **smallest allocation** (**1.7%**), but the largest negative return impact (**-7.55%**).

6. **Strong positive exposure to SMB** and **CMA** may suggest a tilt toward smaller-cap and conservatively investing firms. While **Negative exposure to HML**, may indicate a preference for growth over value stocks.

7. **T**he portfolio is **most vulnerable under a Tech Crash scenario**, driven by its sector concentration while **resilience during a COVID-style crisis**, likely due to the defensiveness of its key holdings.

8. **Reduced portfolio volatility** following the inclusion of candidate stocks. Driven by diversification benefits from MSFT and a decrease in GOOGL's portfolio weight from **77.5%** to **38.8%**. The addition of MSFT helped rebalance both sector allocations and factor exposures, contributing to a decline in VaR and CVaR and improving the portfolio's overall risk-return profile.