Designing and Testing a Quantitative Stock Trading Strategy with Basic Mathematical Tools

Objective:

To implement a basic yet complete quantitative trading strategy using mathematical and statistical techniques. The goal is to experience in the quantitative investment process, from data acquisition to backtesting.

Rough Methodologies Outline:

1. Data Collection and Stock Selection

Objective: Select a manageable set of stocks (e.g., S&P 500 or NASDAQ-100) based on liquidity and availability of historical data.

Data Source: Yahoo Finance or Finnhub.

Tools: Python (with pandas, numpy).

2. Signal Design

Basic Signals:

Momentum

Volatility

Valuation

Standardization

Purpose: Generate interpretable signals indicating expected returns.

3. Signal Combination and Ranking (TBD)

Approach:

Assign weights (e.g., equal weights) to each feature.

Create a composite score for each stock.

Rank stocks based on score.

Selection Rule: Pick top 10 stocks to long, and optionally bottom 10 to short.

4. Portfolio Construction

Method:Try basic mean-variance optimization using historical returns and covariances

5. Backtesting

Frequency: Monthly

Duration: Use past 5–10 years of data.

Evaluation:

Sharpe ratio

Annualized return and volatility

Max drawdown