Financial Information Systems Final Project Questions

Part A Questions

Function Creation

Write a function `runMovingAverageAndBB` that:
- Takes five inputs: (a) a DataFrame with price data for one instrument, (b) `fastWindow` and `slowWindow` for the Moving Average Crossover, and (c) `bbWindow` and `stdevBand` for Bollinger Bands.
- Runs the Moving Average Crossover and Bollinger Bands strategies on the input data and combines the results in a single DataFrame with daily signals for both strategies.

Data Loading

Load the file `PricesProjectA.csv`, which contains daily closing prices from 1999 to 2018 for:
- Six equities: AAPL, AMZN, ATT, GE, INTC, SPY
- Two fixed income instruments: FBNDX, LEHM
- Two commodities: GOLD, SILVER
- Two currency pairs: AUD, EUR

Instrument Selection

Select 8 instruments for your portfolio as follows:
- Five of the six equities, one fixed income instrument, one commodity, and one currency pair.
- For each selected instrument, choose one of the following strategies: Moving Average Crossover, Bollinger Bands, or a benchmark that tracks daily returns.

Parameter Specification

Specify the parameters (`fastWindow`, `slowWindow`, `bbWindow`, `stdevBand`) for each strategy and list these in a Markdown cell for reproducibility.

Parameter Code Block

Include five lines of code at the top of the notebook with chosen parameter values for easy replication, e.g.,

Run Strategies

Run `runMovingAverageAndBB` on all 12 instruments using the chosen parameters, and combine the results into a master DataFrame with 5 columns per instrument.

Strategy Rationale

Provide reasoning for your chosen parameters and strategies for each instrument, focusing on achieving a high Sharpe ratio and balanced risk-return.

Subset Data

Create a DataFrame `myStrategies` with daily returns of only the 8 selected strategies for further analysis.

Correlation Matrix

Calculate and analyze the correlation matrix for `myStrategies`, noting any low correlations that indicate good diversification.

Equal-Weighted Portfolio Sharpe

Calculate the annualized Sharpe ratio of an equal-weighted portfolio using the `myStrategies` DataFrame, comparing it to each individual strategy's performance.

Mean-Variance Optimization (MVO)

Run a 5,000-step Monte Carlo simulation to find the optimal weights for maximizing the portfolio's Sharpe ratio.

Risk/Return Plot

Plot a risk-return scatter plot of all simulated portfolios, highlighting the portfolio with the highest Sharpe ratio.

Part B Questions

Data Loading for Extended Period

Load the new data file, which contains extended closing price data for all the same instruments, covering the period from 1999 through 2022.

Parameter Code Block for Part B

Copy the same five lines of parameter code from Part A for consistency and reproducibility.

Run Strategies for Full Period

Re-run your chosen portfolio strategies with the same parameters over the full period from 1999 through 2022, and create a DataFrame with daily returns through the extended date range.

Portfolio Performance Evaluation

Using the MVO weights from Part A, calculate performance statistics of the maximum-Sharpe portfolio for two periods: in-sample (1999-2018) and out-of-sample (2019-2022). Compare the in-sample Sharpe with the out-of-sample Sharpe.

Passive Benchmark Comparison

Construct an equal-weighted portfolio of the benchmark versions (base returns) of your chosen instruments for the out-of-sample period and calculate its summary statistics.

Performance Commentary

Discuss how your active portfolio performed out-of-sample compared to the passive benchmark. Note whether it outperformed the benchmark and any insights or lessons learned from the results.