Take-Home Programming Test

The goal of this assignment is to assess your coding, problem-solving, and financial risk modeling abilities. For this task, you'll be working with fixed income instruments of your choosing. Please user either Python or C# for the implementation. You are welcome to use any freely available third-party libraries but are expected to discuss why you chose a particular library in your analysis and whether it would be a viable solution for a larger implementation. Feel free to add any additional features or insights that you believe would add value to this analysis.

1. Data Acquisition and Storage:

- Select 3-5 fixed income instruments of your choosing that are accessible via a public API. (No need to get overly complicated here. Use data that is readily available.)
- Retrieve daily yield data for the past 2 years for your selected instruments and save it to a SQL Express database.
- Create a stored procedure in SQL that, when called, retrieves this yield data for the chosen instruments over a given date range.

2. Portfolio Simulation:

- Create a portfolio of the selected fixed income instruments with an arbitrary weightage (ensure they sum to 1).
- Calculate the daily yield changes (delta yield) for this portfolio.

3. VaR Calculation:

- Implement the Historical Simulation method to calculate the VaR for this portfolio.
- Calculate the 1-day VaR for the portfolio at both the 95% and 99% confidence levels.

4. DV01 Calculation:

- Using the retrieved data, compute the DV01 for each of your selected instruments for every day over the 2 years.

5. Stretch (Optional):

- Allow users to adjust the weightage of the fixed income instruments in the portfolio and recalculate VaR.

- Implement an alternate methodology to calculate the VaR. Explain the methodology you chose and compare it to the original result.

6. Documentation:

- Provide a README that explains how to run your code, any external libraries used, and any assumptions made.
- Include a short report (1-2 pages max) explaining your findings, insights about the risk profiles of your chosen fixed income instruments, your reasons for choosing them, and any challenges encountered.

Submission:

Your submission should include:

- Source code.
- SQL schema and stored procedure code
- Any necessary documentation.
- Your report.

Please submit all contents in one zip file to mgerali@pharo.com.

Evaluation Criteria:

- Code quality, readability, and organization.
- Functionality: Does the application perform as required? Consider how scalable your solution would be if more fixed income instruments were added to the portfolio.
- Robustness: How well does the application handle edge cases or unexpected inputs?
- Documentation and Report: Clarity, thoroughness, and the quality of writing.

Good luck, and we look forward to reviewing your solution!