AlgoRisk Insights

Assignment 5

June 23, 2024

Submission Deadline: June 27, 23:59 hrs

Refrain from any means of plagiarism. You can take reference from the web but it should be clearly mentioned in a README file. Submit separate ipynb files for the problems you attempt **only after running all the cells**.

Problem 1. You work as a financial analyst at a reputable investment firm that manages various client portfolios. As part of your routine analysis, you are tasked with assessing the normality of returns for a random portfolio. To ensure that the portfolio's performance aligns with statistical assumptions, you conduct a Jarque-Bera test to test for normality in the return distribution. (The dataset can be found in the attached zip folder.)

Problem 2. Following the assessment of normality using the Jarque-Bera test on the random portfolio returns, you can calculate Value at Risk (VaR) and Conditional Value at Risk (CoVaR) as risk measures for the portfolio.

Problem 3. The objective of this problem is to analyze the NASDAQ and NSE indices to identify their correlation and establish potential lead-lag relationships. The next step is to code Keltner Channel, Bollinger Bands, and MACD indicators, determining the optimal parameters for these indicators on one of the indices and generating buy and sell signals on the other. The time period for this would be 10 years. *(Credits: Stamatics Project 2023)*
Note: Utilize the established relationship to determine which index should be used for parameter optimization and which one for trading purposes.

The steps of the intended solution are as follows:

- **Correlation Analysis:** Calculate the correlation coefficient between the two indices and analyze the strength of the relationship.
- **Lead-Lag Relationship:** Identify potential lead-lag relationships between the indices. Analyze data to determine consistent leading or lagging behavior. Use the lead-lag relationship to determine the index for parameter optimization. Explain choosing the index for parameter optimization.
- **Indicator Coding**
- **Parameter Optimisation:** Optimize parameters for the indicators on one index. Use relevant methods to evaluate your strategy.
- **Signal Generation:** Apply optimized parameters to the other index. Generate buy and sell signals using the indicators. Record the signals, their respective dates and returns along with other metrics covered before.