Week1 Assignment

Calculate Portfolio Monthly and Yearly Return and Attribute by Asset Class

Objective

The goal of this assignment is to calculate the portfolio's monthly and yearly returns as a percentage based on dollar Profit and Loss (PnL), while accounting for any new allocations (subscriptions) and redemptions (withdrawals) that occur within the portfolio. Additionally, you are to attribute these returns across five asset classes: Equity, Rates, Commodity, FX, and Credit.

Data Sources

- **BOM AUM**: This tab shows the portfolio's AUM (Assets Under Management) at the beginning of the month. Specifically, the AUM for the portfolio on the morning of 8/1/2024 was 200 million. The AUM for each month will reconcile at beginning of the month.
- **Allocation**: This tab contains details of capital activity (new subscriptions or redemptions) within the portfolio. For example, on 8/14/2024 after market close, investors wired 100 million into the portfolio. On 8/20/2024, after market close, investors withdrew 50 million from the portfolio.
- **PnL by Asset Class**: This tab contains the portfolio's daily PnL (in dollars) by asset class. There are five asset classes: Equity, Rates, Commodity, FX, and Credit.

Considerations and Assumptions

- The code should be written to be flexible and adaptable, allowing for the analysis of multiple months or additional portfolios if required.
- BOD AUM (Beginning of Day AUM): You need to determine the Beginning of Day AUM for each day, considering the AUM from the previous day, any capital allocation activities (subscriptions or redemptions), and the daily PnL.
- Daily Return Calculation: Use the daily PnL by asset class and the Beginning of Day AUM to calculate both the daily return for each asset class and the daily return for the portfolio.
- Monthly Return Calculation: Calculate the monthly returns independently for each month. This allows you to assess each month's performance in isolation. The monthly return of the portfolio should be calculated by compounding the daily returns of the portfolio for that month.
- Monthly Return Attribution: To attribute the monthly return of the portfolio to each asset class, assume an initial hypothetical AUM of 100 at the beginning of the month for the entire portfolio. Then, calculate the hypothetical daily PnL for each asset class throughout the month (using the daily return data for each asset class). The sum of the cumulative hypothetical daily PnL for each asset class should match the total portfolio monthly return to ensure consistency and traceability.
- Yearly Return Calculation: Yearly Return should be calculated by compounding monthly return. Use the same hypothetical PnL approach for calculating the yearly return attributions. Leverage the monthly returns by asset class and the monthly portfolio returns to calculate the overall yearly performance.

Sample Output

1. Calculate the portfolio's monthly return and yearly return in percentage.
2. Attribute the monthly return to each asset class. For example, if the portfolio's monthly return is 15%, we might attribute it as follows: Equity contributes 5%, Rates 4%, Commodity 3%, FX 2%, and Credit 1%.
3. Present results in the well-structured DataFrame