Instructions for Teams:

Overview

In this case competition, teams will design and implement a predictive model for stock prices of two competing companies in the energy sector: *HydroCorp* (oil and gas) and *BrightFuture Renewables* (renewable energy). Teams will need to make trading decisions with a $100,000 starting budget, adhering to market restrictions and including transaction costs.

Tasks

1. **Mathematical Model:**

   - Model the information about both companies mathematically. Use this to predict the values of both stocks and guide your trading decisions.
   - Use the historical data to check your models accuracy.
   - Use any approach you prefer to model the stock prices as long as prices can be modelled.

2. **Daily Trading Simulation:**

   You have been provided with a Python file: `QFC_fin_modelling_template.py`. This file contains code which will simulate your trading strategy.

   - Read the `QFC_fin_modelling_template.py` carefully.
   - Implement the `update_portfollio` function. This function will be called to simulate your strategy making daily trade decisions over the course of 365 days.
   - You should use the `Portfollio.buy` and `Portfolio.sell` methods to update your portfolio within the `update_portfollio` function. Further, this is the only way in which you may update your portfolio.
   - Use the `context` argument to save any data you would like to persist between calls.
   - The goal is to make as much money as possible.

3. **Presentation:**

   - Model Explanation: In your presentation, clearly explain how you arrived at your model. Discuss the statistical methods or other approaches used to predict stock prices.
   - Market Relationships: Identify the key relationships between stock price movements and any interdependence between stocks and/or their long term average.
   - Hedging Strategy: For each potential shock mentioned, using data from your model on that day, discuss how you would hedge against these risks.

Restrictions

1. **Transaction Fees:** A 0.5% transaction fee is added for every buy/sell order. This simulates real-world trading costs. This is built into the buy and sell functions provided to you in the Python code.

2. **Do not manually change the values of the stocks:** Any submission which changes the values of the stocks will not be counted.

3. **Use the buy and sell functions:** Within `update_portfollio`, you may only update your portfolio via the `Portfollio.buy` and `Portfolio.sell` methods. Do not manually change how many units of stock are in your portfolio. Any submission which does this will not be counted.

How the Judges Grade You

1. **Model:** Teams should focus on developing a reliable predictive model. The performance of this model will be critical to making profitable trading decisions. Judges will take into consideration:

   (i) Your models accuracy and sophistication.
   (ii) How mathematically elegant your model is.

2. **Strategy:** Your trading strategy will execute on the values of the stock (which is unknown to you at the time of submission). How much profit your strategy is able to generate will play a significant role in the evaluation.

3. **Presentation:** Focus on clearly articulating your methodology and the insights your model provides. Your ability to justify your model's decisions will play a significant role in the evaluation.

Final Deliverables:

1. **Code:** A Python implementation that can perform the daily trading simulation, given the input stock price data. That is, an implementation of the `update_portfollio` function.

2. **Report:** A detailed report that explains the mathematical model, trading strategy, code, and hedging strategies. The report should cover all aspects of the approach, with clear explanations and any assumptions. It is preferred that you write the report using latex but not necessary.

3. **Presentation:** A 5-10 minute presentation explaining the mathematical model, the assumptions that underlie it, the trading strategy you arrived at based on your model, and the hedging strategy in the event of shocks. This will be presented on Wednesday, January 22, 2025 and may include questions from judges.

Both the code and the report are due by 3:00 PM on Wednesday, January 22, 2025. We will send out instructions on how to submit.

Good luck!