Winter School of Quant Final Assignment

Objective:

Develop a novel alpha strategy by combining or modifying existing alphas from the WorldQuant BRAIN documentation. The Alpha should be able to meet the given requirements and should perform better than the existing alpha .

Report Structure: (For Example)

1. Idea Generation:

- ☐ **Alpha Concept:**
  Develop an alpha strategy inspired by the hypotheses in the WorldQuant BRAIN courses and the documented alphas in 19 Alpha Examples.
- ☐ **Rationale:**
  The goal is to combine or smooth signals such that they exhibit lower correlation and better performance.
- ☐ **Fundamental Data Signals Used:**
  - Inventory Turnover
  - Price-to-Book Ratio (P/B)
  - Earnings Surprise

2. Alpha Formulation:

- **Mathematical Definition:**
  One example combining and smoothing could be:
- **Logical Explanation:**

$$\text{rank}(\text{ts\_zscore}(\text{inventory\_turnover}, 240)) - \text{rank}(\text{decay\_linear}(\text{earnings\_surprise}, 20))$$

  - The `ts_zscore` captures deviations from historical inventory turnover behavior.
  - The `decay_linear` function smoothens the earnings surprise effect over a shorter period (20 days).
  - By subtracting these two ranked indicators, the alpha captures both operational efficiency and market reaction to financial results.

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3. Performance Improvement Methods:

- **Enhancement Techniques:**

    - **Parameter Tuning:** Adjusting the lookback period for `ts_zscore` and `decay_linear`.
    - **Signal Smoothing:** Applying `decay_linear` for a weighted average effect.
    - **Signal Combination:** Blending multiple fundamental factors for diversification.
- **Correlation Reduction Method:**
    - Ensuring correlation with the base alpha is below 0.8 by backtesting and analyzing the correlation matrix.
- **Performance Summary:**
    - Comparison of the modified alpha vs. base alpha.
    - Highlight any improvement in Sharpe Ratio and drawdown control.

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4. Final Results:

- **Key Metrics to Report:**
    - **Sharpe Ratio:** Target > 1.7
    - **Turnover:** Target < 50%
    - **Maximum Drawdown**
    - **Cumulative Returns (Graphical Representation)**
- **Performance Interpretation:**
    - **Strengths:** Reduced correlation, diversified signal source, and improved return stability.
    - **Weaknesses:** Potential overfitting due to excessive smoothing or parameter tuning.

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5. Potential Improvements:

- **Ideas for Refinement:**
    - Introducing additional factors like **volatility-adjusted momentum**.
    - Using **non-linear transformations** like exponential smoothing or power normalization.
    - Extending the lookback period for more stable signals.

Submission Guidelines Recap:

- **Deadline:** January 17th
- **Target Metrics:**
    - **Sharpe Ratio > 1.7**
    - **Turnover < 50%**
- **Deliverables:**

- A detailed report following the structure above.
- Code or logical steps for the alpha generation.
- Performance metrics and graphical results.
