Systematic Trading Module

Practical Project

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8th January 2026

Systematic Backtesting Engine

Objective: Develop a robust Python-based backtesting framework to design, calibrate, and validate a quantitative trading strategy.

- **Data Universe:** 6 months of 1-minute intraday data for major global stock indices (e.g., S&P 500, FTSE 100).
- **Methodology:**
  - **In-Sample (IS):** Use first 5 months (maximum) for model tuning and parameter optimisation.
  - **Out-of-Sample (OOS):** Final 1 month reserved for walk-forward validation (minimum).
- **Constraints:** The engine must simulate a "live" environment - playing daily price evolution without look-ahead bias.

Strategy Implementation Requirements

The Python engine must process signals and execute trades based on the following logic:

- **Signal Logic:** Define entry/exit points, Long/Short positions, and trade sizing (e.g., proportional sizing).
- **Risk Management:** Implementation of stop-loss and profit-taking levels is highly recommended to manage tail risk.
- **Execution & Frictions:**
  - Include transaction fees for every trade:

$$\text{total-fees} \mathrel{+}= |\textit{position}| * \text{ basis-point } * (S_{start} + S_{end})$$

    where basis-point $= 0.0001$.
  - Report P&L both **Gross** and **Net** of fees to evaluate strategy viability.
- **Portfolio Construction:** Compute daily returns per underlying, then apply weights to derive the total daily portfolio return.

Deliverables & Performance Reporting

1. **Written Report (10–15 pages):**
   - Technical description of the strategy (words and LaTeX equations).
   - Discussion on **challenges encountered** (e.g., microstructure noise, regime shifts, or slippage).
2. **Performance Matrix (OOS Data):** Report annualised metrics (e.g., Sharpe Ratio) at both the **Underlying** and **Portfolio** levels.

Asset	**Net Return**	**Ann. Sharpe**	**Max DD**	**Avg Daily Trades**
Index A	**%**		**%**	**#**
Index B	**%**		**%**	**#**
Portfolio	**%**		**%**	**#**

The end

Thank You !