

Part 1: Take-Home Project

Deliverables: a url to a GitHub repository with frequent and meaningful commit logging.

The repository should contain:

- 1. The properly structured python modules**
- 2. A demo usage example in a single Jupyter notebook showcasing the entire workflow you've implemented.**

Resources: You can use Google, Stack Overflow or other search engines and forums. **No LLM's** (ChatGPT, Grok, DeepSeek etc.)

General Requirements:

You can spend **20** minutes on design and architecture first. We'll have a brief call to discuss your design docs.

Low level implementations are encouraged. (You should be able to perform most of the calculations using **NumPy** and **pandas only**.)

Implement everything in **OOP**. Make your code as flexible and reusable as possible.

Objectives:

0. Before proceeding, read this document carefully and review the data files in the package:

canadian_funds_data_long.csv

us_etfs_data_wide.csv

Macro.xlsx

FF_Factors.xlsx

1. Design and implement a python module that reads, validates, and pre-processes the provided data. (Please handle missing values, inconsistent data types and any other data anomalies properly)

2. Design and implement another python module that calculates the following metrics in varying lookback windows including **[1Y, 3Y, 5Y, 7Y, 10Y, Since Inception]**. Make sure your methods can take multiple funds/

assets. If multiple assets are given, the output for each asset should be comparable with the others in the dataset:

1. Metrics
 - a. CAGR
 - b. Volatility
 - c. CVaR
 - d. AVaR
 - e. Maximum Drawdown
 - f. Downside Deviation
2. Ratios
 - a. Sharpe
 - b. Sortino
 - c. MAR Ratio (RoMaD)
 - d. Omega Ratio
3. Regressions (**Do not use pre-built statistical analysis packages. Simple OLS from scratch with NumPy will be sufficient.**)
 - a. CAPM:
 - i. Beta
 - ii. Alpha
 - iii. Unsystematic Risk
 - b. Fama French
 - i. Factor Betas
 - ii. Alpha

Output: One pandas DataFrame that shows results for each category of calculations on the provided fund datasets (both Canadian Funds and US ETFs).

Bonus (Optional):

Build I/O functionality into your modules and save the output data in an excel file.

Build Unit Tests for each method. You can use pre-built packages here to verify your results.

Good luck!