Data-Driven Portfolio Optimization Using Python and AI for Wealth Management

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Objective

This project is a collaborative initiative with a local wealth management company aimed at enhancing the firm's portfolio construction process through data science and AI. The research is use-inspired, targeting real-world challenges in tailoring investment strategies for clients with diverse financial goals, risk tolerances, and asset preferences.

Methodology

The primary objective is to design and evaluate asset allocation strategies that are both data-informed and client-personalized. The project will leverage Python to:

- Collect and preprocess historical financial data across multiple asset classes
- Implement and back-test various portfolio strategies, including traditional (e.g., mean-variance optimization) and modern (e.g., risk parity, momentum-based) approaches
- Visualize performance metrics such as returns, volatility, drawdown, and Sharpe ratio to assess strategy robustness under different market conditions

Additionally, AI techniques will be introduced to identify non-obvious patterns in historical data, forecast market conditions, and recommend allocation adjustments based on changing risk profiles or market regimes.

Expected outcomes

The project aims to deliver:

- A scalable and replicable Python-based framework for strategy back-testing and analysis
- Actionable insights to inform the wealth manager's asset allocation decisions
- Potential use cases where AI can augment traditional investment analysis, such as clustering clients based on behavior or extracting insights from unstructured data (e.g., news articles, analyst reports)
- A research report summarizing findings, codebase, and visualizations suitable for internal and client-facing use

Role of Data Science and AI

Data science serves as the foundation for all analyses, from data collection and cleaning to statistical evaluation of portfolio strategies. AI, particularly machine learning and LLMs, will be explored for its ability to enhance decision-making by identifying patterns, optimizing parameters, and adapting strategies in response to market dynamics and client needs.