Client Reporting & Performance Analytics Pipeline

Technical Take-Home Exercise for AMA Program

Project Overview

Scenario:
You are part of the Performance and Analytics team during your rotation in the Asset Management Associate (AMA) program. Each month, you are responsible for generating client-ready reports that provide comprehensive portfolio performance analysis, risk metrics, and key holdings summaries.

Business Context:
Accurate and timely client reporting is critical for maintaining client relationships and demonstrating value. Your ability to build robust, automated reporting pipelines will directly support the firm's client service capabilities and operational efficiency.

Your team receives daily portfolio data from multiple sources with varying data quality standards. The data includes:

- Client portfolio holdings across 50 international assets
- Daily asset prices in local currencies (USD, EUR, GBP, JPY, CAD, AUD, CHF, SEK)
- Currency conversion rates for accurate USD-based performance reporting
- Various data quality issues typical of real-world financial data processing

Your Assignment: Build an automated data pipeline that processes this multi-currency portfolio data and generates professional client-ready performance reports.

Project Objectives

Build a comprehensive Python-based data pipeline that:

1. **Ingests and cleans** messy portfolio holdings and price data
2. **Currency Conversion** for all asset values to USD using appropriate daily exchange rates

3. **Calculates key performance metrics** including returns, volatility, and risk measures
4. **Generates professional reports** suitable for client distribution
5. **Automates the reporting process** for scalability

Data Description

You will be provided with two CSV files containing real-world-style data (masked for privacy):

1. **holdings_with_currency.csv**

- Contains: Daily portfolio positions for 10 clients across 50 assets over 6 months
- Data Issues: Missing quantities, duplicate entries and/or more

2. **prices_with_currency.csv**

- Contains: Daily asset prices in local currencies
- Data Issues: Missing prices, duplicate entries and/or more

3. **currency_rates.csv**

- Contains: Daily exchange rates for currency conversion to USD
- Data Issues: Missing rates, duplicate entries and/or more

4. **asset_currency_reference.csv**

- Contains: Clean reference mapping each asset to its trading currency
- Purpose: Use this to validate and correct currency assignments in other datasets

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Required Deliverables

1. Data Cleaning & Processing Pipeline

- Python script/notebook that systematically cleans the provided data
- Document all data quality issues identified and cleaning steps taken
- Implement data validation checks and error handling

- Create a merged dataset ready for analysis

2. Performance Analytics

Calculate and present the following metrics for each client:

- **Returns Analysis:**
  - Daily, monthly, and cumulative returns
  - Time-weighted returns
- **Risk Metrics:**
  - Portfolio volatility (standard deviation of daily returns)
  - Maximum drawdown
  - Sharpe ratio (assume risk-free rate of 2%)
- **Holdings Analysis:**
  - Top 10 holdings by value at month-end
  - Portfolio concentration metrics

3. Professional Report Generation

Create a formatted client-ready report (Excel or PDF) containing:

- Executive summary table with key metrics
- Performance charts (cumulative returns, monthly performance)
- Holdings breakdown (top 10 table, allocation pie chart)
- Professional formatting suitable for client distribution

4. Written Communication

- Brief written summary explaining:
  - Key findings and insights
  - Data quality challenges encountered
  - Methodology and assumptions
  - Recommendations for process improvements

Technical Requirements

- **Language:** Python (Jupyter Notebook preferred)
- **Documentation:** Clear code comments and markdown explanations
- **Error Handling:** Robust handling of data quality issues

Evaluation Criteria

Technical Proficiency

- Data cleaning methodology and thoroughness
- Accuracy of financial calculations
- Code quality, structure, and documentation
- Appropriate use of Python libraries

Business Acumen

- Understanding of asset management metrics
- Quality of insights and analysis
- Professional presentation of results
- Practical recommendations

Communication

- Clarity of written explanations
- Professional report formatting
- Ability to explain technical concepts to business stakeholders

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Submission Guidelines

Format:

- Jupyter Notebook (.ipynb) with all code and analysis
- Final report file (Excel or PDF)

- Written summary (Word document or markdown)

Tips for Success

1. **Start with data exploration** - understand the data quality issues before diving into analysis
2. **Document your decisions** - explain your cleaning and calculation methodologies
3. **Think like a client** - what metrics and insights would be most valuable?
4. **Focus on automation** - build processes that could scale to handle multiple clients
5. **Validate your results** - sanity-check your calculations and outputs

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Questions?

If you encounter technical issues or need clarification on requirements, please document your assumptions and proceed accordingly. We're interested in seeing your problem-solving approach and business judgment.

> *This exercise simulates real-world challenges faced in asset management operations and will help us assess your analytical, technical, and communication capabilities relevant to the AMA program.*