Project 2: Financial Analytics – Portfolio Risk & Volatility Monitor

Project Duration

4 Weeks (End-to-End Analytics Project)

1. Introduction

In today's data-driven financial environment, understanding **risk and return behavior** of assets is critical for informed decision-making. This project focuses on analyzing historical price data to evaluate asset performance, volatility, and risk using **data analytics and visualization techniques**.

The project is designed as an **end-to-end analytics case study**, suitable for a **fresher or entry-level data analyst**, demonstrating practical skills in data preparation, financial metrics, and dashboard creation.

2. Project Objectives

The primary objectives of this project are:

- To analyze historical asset price data
- To calculate daily returns and rolling volatility
- To understand risk patterns using statistical methods
- To simulate future return behavior using Monte Carlo simulation
- To visualize financial insights using Tableau dashboards
- To present results in a clear and professional manner

3. Tools & Technologies Used

- **Python** – Data cleaning, calculations, simulation
- **Pandas & NumPy** – Data manipulation and numerical analysis
- **CSV Files** – Intermediate and final datasets
- **Tableau** – Interactive data visualization and dashboard creation
- **GitHub** – Project version control and documentation

4. Dataset Description

Multiple datasets were used throughout the project lifecycle:

- **raw_prices.csv** – Raw historical price data
- **clean_prices.csv** – Cleaned and formatted price data
- **rolling_volatility.csv** – Calculated rolling volatility values
- **monte_carlo_returns.csv** – Simulated return paths generated using Monte Carlo simulation

Each dataset represents a specific stage of the analytical workflow.

5. Methodology (Week-wise Execution)

5.1 Week 1: Data Collection & Cleaning

Activities Performed:

- Imported raw historical price data
- Checked for missing values and inconsistencies
- Converted date columns into proper date format
- Ensured numerical values were standardized

Outcome:

- A clean and analysis-ready dataset (clean_prices.csv)

5.2 Week 2: Return & Volatility Analysis

Daily Return Calculation:
Daily returns were calculated using the formula:

Daily Return = (Today Price – Previous Day Price) / Previous Day Price

Rolling Volatility:

- 30-day rolling volatility was computed using the standard deviation of daily returns
- This metric was used to measure asset risk over time

Return Distribution:

- A histogram was created to visualize the frequency distribution of daily returns

Outcome:

- Identification of high-risk and low-risk periods
- Creation of volatility trends and return behavior insights

5.3 Week 3: Monte Carlo Simulation & Correlation Analysis

Monte Carlo Simulation:

- Multiple simulated return paths were generated based on historical return statistics
- This approach helps in understanding possible future outcomes under uncertainty

Correlation Heatmap:

- Correlation between simulated return paths was calculated
- A heatmap was created in Tableau to visualize dependency patterns

Outcome:

- Enhanced understanding of risk variability
- Visualization of correlation structure using heatmaps

5.4 Week 4: Visualization & Dashboard Development

Tableau Dashboard Features:

- Price trend with moving average
- Daily return time-series

- Rolling volatility visualization
- Return distribution histogram
- Correlation heatmap
- Interactive date filters

Dashboard Objective:
To provide a **single unified view** of asset performance, risk, and statistical behavior.

6. Key Insights & Findings

- Asset prices exhibit short-term fluctuations but long-term trends are visible using moving averages
- Volatility spikes often correspond to periods of increased uncertainty
- Daily returns generally follow a near-normal distribution with occasional extreme values
- Monte Carlo simulation highlights the range of possible future return scenarios
- Correlation analysis helps understand dependency and diversification behavior

7. Challenges Faced

- Handling time-series table calculations in Tableau
- Understanding correct dataset structure for correlation analysis
- Managing rolling window calculations
- Ensuring accurate interpretation of financial metrics

These challenges were resolved through structured data preparation and step-by-step validation.

8. Conclusion

This project successfully demonstrates an **end-to-end financial data analysis workflow**, combining data engineering, analytics, and visualization. It highlights practical applications of financial metrics and provides meaningful insights through an interactive dashboard.

The project is suitable as a **portfolio project** for data analyst or business analyst roles and showcases the ability to work with real-world financial datasets.