Stock Market Volatility Analysis

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Introduction

- **Stock Markets are Inherently Volatile And Unpredictable**
- **Understanding and modeling volatility is crucial for risk assessment, portfolio management, and forecasting.**
- **Dataset focuses on Apple share from January-May 2025**

Objective

- Simulate Stock Price Behavior
- Evaluate Statistical Properties of the Simulated Data
- Validate and Compare Simulated Result Against Real Data

Methodology

- Data Gathering
- Monte Carlo Simulation
- Statistical Testing
- Visualization and Interpretation

Monte Carlo Simulation

- Generates multiple random future price paths
- Geometric Brownian Motion is Used
- Formula Used

$$S_t = S_0 \cdot e^{(\mu - 21\sigma 2)t + \sigma W_t}$$

Matlab Implementation

- Loaded Historical Data from CSV
- Simulates a Price Path Using Geometric Brownian Motion
- Visualized result with plot()
- Validated with T-test and K-S test

Key Takeaway

- Monte Carlo models price behavior under uncertainty.
- T-Test & K–S Test validate similarity to real data.
- Simulation reveals key volatility insights.

Reference

- Hull, J. C. – *Options, Futures, and Other Derivatives*
- Glasserman, P. – *Monte Carlo Methods in Financial Engineering*
- MathWorks (MATLAB) Documentation – ttest, kstest, randn, plot, etc.
- Investing.com – Historical stock price data (CSV export)
- ChatGPT (OpenAI, 2025) – Assisted with project outline, explanations, and presentation structuring

GitHub - https://github.com/SofiqulSohan/StockVolatilityAnalysis/