Nonparametric Jump Intensity Estimation - Assignment 10

Introduction

This assignment involves estimating the jump intensity of a stock's returns using a nonparametric approach. The jump intensity is a measure of the frequency of large price movements (jumps) in the stock's price process. The goal is to calculate the full-sample jump intensity, as well as a time-varying rolling jump intensity using a 3-month rolling window and visualize the results.

Data and Methodology

Data Collection

1. Collected 3 years of daily stock data for Tesla (TSLA) using the yfinance library in Python.
2. Calculated a rolling 3-month (90-day) jump intensity time series using a moving average window.

Results

The results section includes the plot as well as the following:

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Estimated Jump Size Variance: 0.199234579874896
Estimated Jump Intensity: 1.311491259075582e-05
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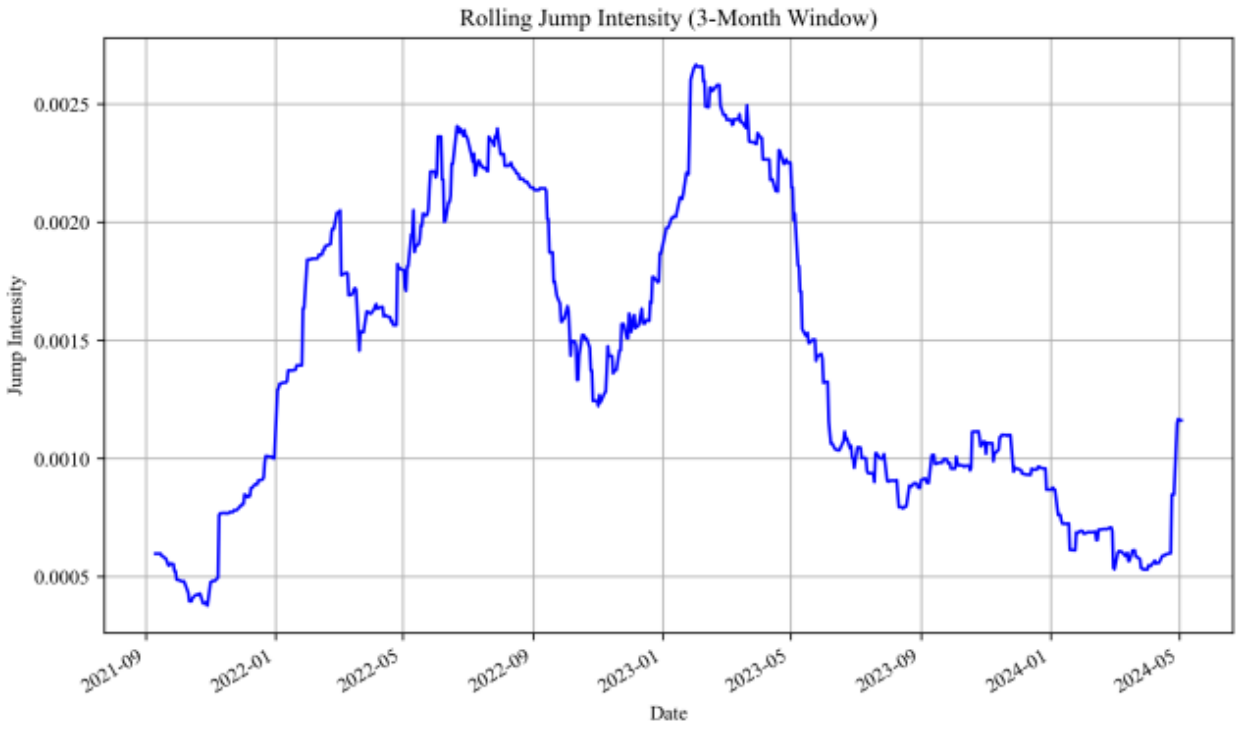
Conclusion/Analysis of Results

The nonparametric jump intensity estimation provides insights into the frequency and magnitude of jumps in the stock's price. The full-sample jump intensity gives an overall measure of the jump intensity for the entire sample period.

The rolling jump intensity plot (Image 1) reveals the time-varying nature of the jump intensity for Tesla (TSLA) stock. The plot shows periods of elevated jump intensity, indicating higher volatility and more frequent large price movements, as well as periods of lower jump intensity, suggesting more stable and gradual price changes.

By using a rolling 3-month (90-day) window, the jump intensity estimate adapts to the changing market conditions and incorporates the most recent data, providing a better view of the stock's jump behavior over time.

It's important to note that the nonparametric method used in this assignment assumes a relationship between absolute returns and jump intensity, which may not hold true in all markets.


Rolling Jump Intensity (3-Month Window)
Jump Intensity
0.0025
0.0020
0.0015
0.0010
0.0005
2021-09
2022-01
2022-05
2022-09
2023-01
2023-05
2023-09
2024-01
2024-05
Date