Midterm Project: Research on Stock volatility vs volume

The goal

Find the mathematical equation(s) to describe the relationship between volatility vs volume.

Hints:

Your equation(s) must have volatility vs volume . You may include anything else into your equation(s).

The possible equation(s) may be: linear equations, linear systems, non-linear systems, polynomials, ODE or PDE.

Show that your data fits your equation(s).

Background Knowledge

Every publicly traded stock experience intraday and daily price movement.

Another important metric is trading volume, which represents total shares traded during the day.

Step 1:

Start using AAPL (Apple Inc.) or any stock dataset of your choice.

https://finance.yahoo.com/quote/AAPL/history/?period1=1640995200&period2=1735603200

Compute:

We compute the intraday volatility as Volatility = (High-Low)/Close

We then compute the daily volume change as Volume_delta = Volume_today - Volume_previousday

We then compute the daily volatility change as Volatility_delta = Volatility_today - Volatility_previouday

Plot Volume_delta and Volatility_delta.

Plot Volume_delta vs Return_delta and analyze the relationship.

Fit mathematical equation(s) and calibrate unknown coefficients using numerical methods.

Use last 5 years of the chosen stock to test your equation.

Step 2:

Pick two other stocks (e.g., from the list of most active stocks).

Repeat Step 1 for each.

Compare:

- Which stock fits your model best?

- Which fits worst?

- Provide explanation.

Step 3:

Extend to ETFs or cryptocurrencies.

Examples: SPY, QQQ, BTC-USD, ETH-USD.

Analyze whether your equation works for these assets.

Grading (10 points):

- Data processing & analysis: 3 pts

- Equations in LaTeX: 3 pts

- Findings & discussion: 3 pts

- Summary: 1 pt

Late policy: –2.5 pts per day

Submit .ipynb + HTML.