# What is the impact of new product announcements on the stock volatility of major technology companies?

Dauer L. Profumo N. Tognolini B. Angevin P.

December 11, 2024

# Table of content


1. Introduction
2. Shiny app.R
3. Data
4. Descriptive Analysis
5. Model
6. Results
7. Conclusion
8. Bibliography

# Introduction: Theme

- Why did we choose this topic ?

# Introduction: Theme

- Why did we choose this topic ?
- We are 4 students studying Finance who are interested in financial markets.

# Introduction: Theme

- Why did we choose this topic ?
- We are 4 students studying Finance who are interested in financial markets.
- We wanted to learn how to use IT as a tool for finance

# Introduction: Theme

- Why did we choose this topic ?
- We are 4 students studying Finance who are interested in financial markets.
- We wanted to learn how to use IT as a tool for finance
- And we were wondering if there is any correlation between stock prices and product announcements for companies such as Apple, Amazon, Tesla etc...

# Introduction: Git and Github

- As everything was new for us, we first got our hands dirty on GitHub.

# Introduction: Git and Github

- As everything was new for us, we first got our hands dirty on GitHub.
- We learned what Git and Github was and found out how to track and manage versions of a local and remote repository by using the main git commands via Git Bash (git status, git add, git commit, git push/pull, git clone, etc...).

# Introduction: Git and Github

```
PS C:\Users\Admin\Desktop\digital_tools> git push origin master
Enumerating objects: 9, done.
Counting objects: 100% (9/9), done.
Delta compression using up to 20 threads
Compressing objects: 100% (5/5), done.
Writing objects: 100% (5/5), 485 bytes | 242.00 KiB/s, done.
Total 5 (delta 2), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (2/2), completed with 2 local objects.
To https://github.com/PierreAg1/stock_analysis.git
   db417ee..0321c82  master -> master
PS C:\Users\Admin\Desktop\digital_tools>
```

Figure: Pushing changes on branch master of a Github repository

# Introduction: Repository Structure

```
├── Data                # Data used for our analysis
├── Text                # Documentation files
│   ├── presentation    # Presentation of project
│   └── report          # Report of project
├── code
│   ├── notebook        # Python notebook that performs analysis
│   └── output          # Charts outputted from code
├── .gitignore          # Git configuration to ignore specific files or directories
├── Dockerfile          # Instructions to build a Docker image for the project
├── app.R               # Interactive R Shiny app
├── README.md           # Project overview and instructions
└── requirements.txt    # Python dependencies for the project
```

Figure: Our Github repository structure

# Shiny app.R

- Dockerfile
- requirements.txt
- app.R
- results in the browser with the graphic

# Data

- 2 datasets:
  - Company announcements dataset retrieved from ChatGPT and official company websites.
  - Daily stock prices dataset in USD (adjusted for dividends) from 31.12.2013-31.12.2023 for the ten biggest tech firms in terms of current market capitalization compiled with Refinitiv EIKON (Datastream).
- Key steps:
  - Data Importation, Merging and Cleaning.
  - Compute Daily Returns & Rolling Volatility

# Data: Libraries Importations

- pandas for data manipulation and analysis
- matplotlib for creating visualisations
- numpy for numerical computation
- seaborn for enhanced statistical visualisations
- scikit-learn for statical modeling (linear regression) and for model validation

# Data: Data Importation, Merging and Cleaning

- Import both Excel spreadsheets thanks to Pandas library.

# Data: Data Importation, Merging and Cleaning

- Import both Excel spreadsheets thanks to Pandas library.
- Ensure consistency between data types before merging.

# Data: Data Importation, Merging and Cleaning

- Import both Excel spreadsheets thanks to Pandas library.
- Ensure consistency between data types before merging.
- Deal with inconsistent or missing values (e.g. zero or negative stock prices).

# Data: Compute Daily Returns & Rolling Volatility

- Computed the daily stock returns and rolling volatility over a 10-day window.

# Data: Compute Daily Returns & Rolling Volatility

- Computed the daily stock returns and rolling volatility over a 10-day window.
- Delete the missing values because the first row of each stock can't provide a daily return and that the 10 day rolling volatility can't be computed before having 10 data points.

# Data: Compute Daily Returns & Rolling Volatility

| Name | Date | Announcement | StockPrice | Daily_Return | Rolling_Volatility |
|---|---|---|---|---|---|
| AMZN | 2014-01-14 | NaN | 20299.90 | 0.016778 | 0.010152 |
| AMZN | 2014-01-15 | NaN | 20214.63 | -0.004201 | 0.010226 |
| AMZN | 2014-01-16 | NaN | 20211.05 | -0.000177 | 0.010216 |
| AMZN | 2014-01-17 | NaN | 20405.61 | 0.009626 | 0.010606 |
| AMZN | 2014-01-20 | NaN | 20405.61 | 0.000000 | 0.010248 |

Table: Sample of the final dataset

# Descriptive Analysis

- Descriptive Statistics of the Daily Returns
- Cumulative Performance Analysis
- Volatility Analysis
- Spotting Patterns between Volatility and Product Announcements

# Descriptive Analysis: Daily Returns

| Name | Mean (%) | Std (%) | Min (%) | Max (%) |
|---|---|---|---|---|
| AMZN | 0.100 | 2.055 | -14.049 | 14.131 |
| APPL | 0.109 | 1.758 | -12.865 | 11.981 |
| AVGO | 0.151 | 2.156 | -19.913 | 15.834 |
| GOOG | 0.077 | 1.727 | -11.634 | 16.259 |
| META | 0.098 | 2.315 | -26.390 | 23.283 |
| MSFT | 0.112 | 1.675 | -14.739 | 14.217 |
| NVDA | 0.230 | 2.872 | -18.756 | 29.807 |
| TECHY | 0.070 | 2.189 | -12.418 | 23.261 |
| TSLA | 0.186 | 3.447 | -21.063 | 19.895 |
| TSMC | 0.091 | 1.617 | -8.870 | 10.337 |

Table: Descriptive Statistics of the Daily Returns by firm

# Descriptive Analysis: Cumulative Performance Analysis

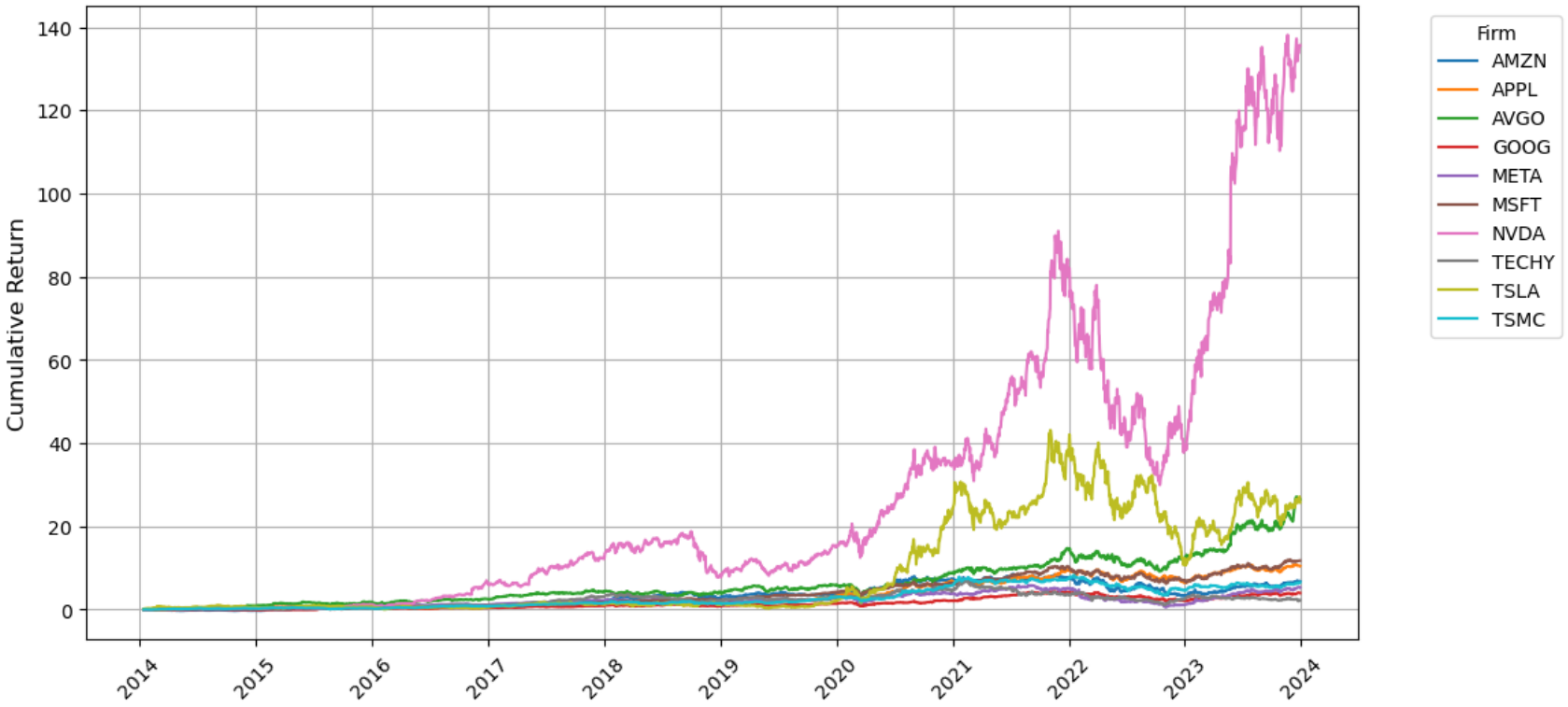


Figure: Cumulative Performance by firm

# Descriptive Analysis: Volatility Analysis

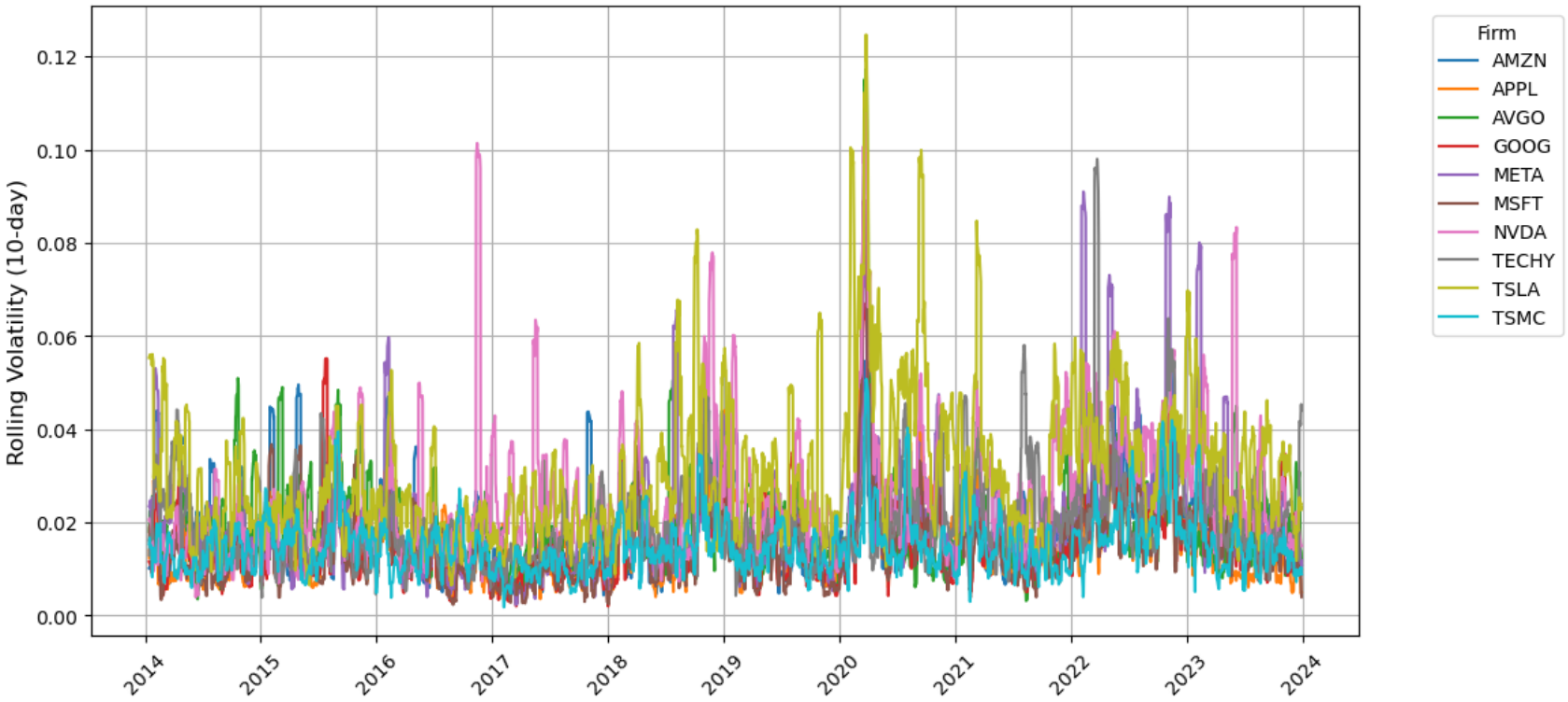


Figure: Volatility over Time by firm

# Descriptive Analysis: Spotting Patterns(1)

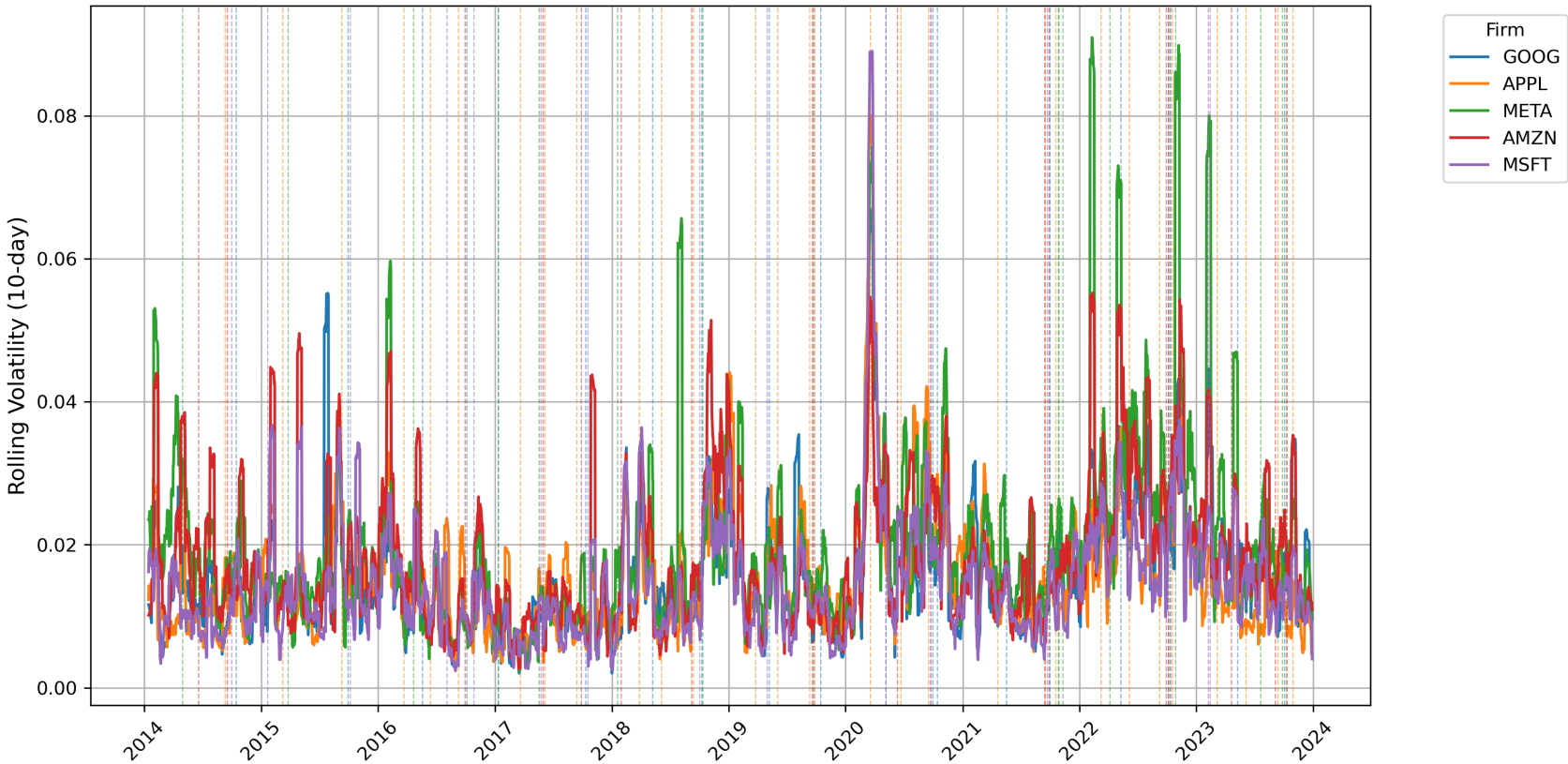


Figure: Volatility and Product Announcements for GAFAM

# Descriptive Analysis: Spotting Patterns(2)

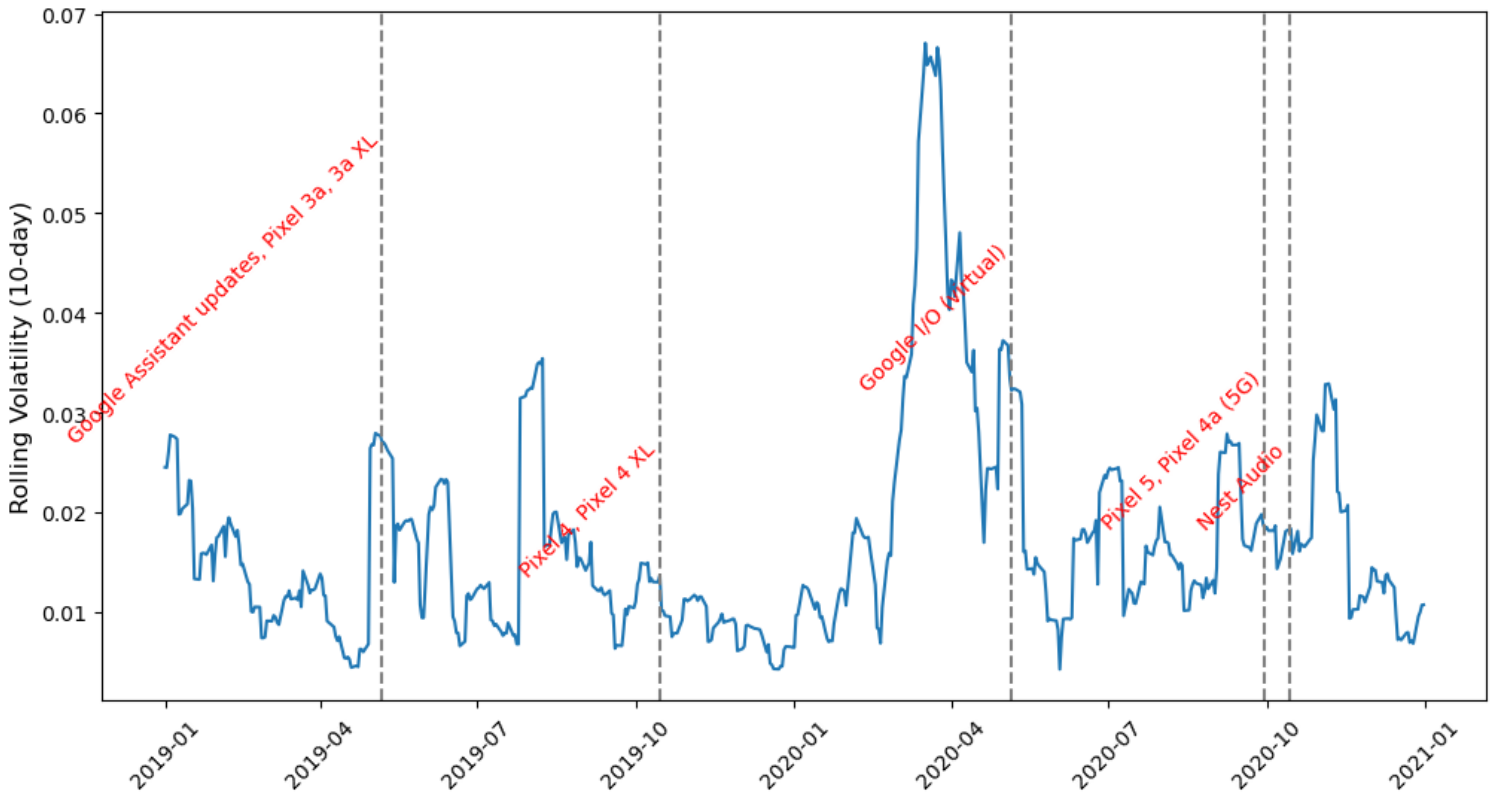


Figure: Volatility and Product Announcements during COVID crisis for Google

# Descriptive Analysis: Spotting Patterns(3)

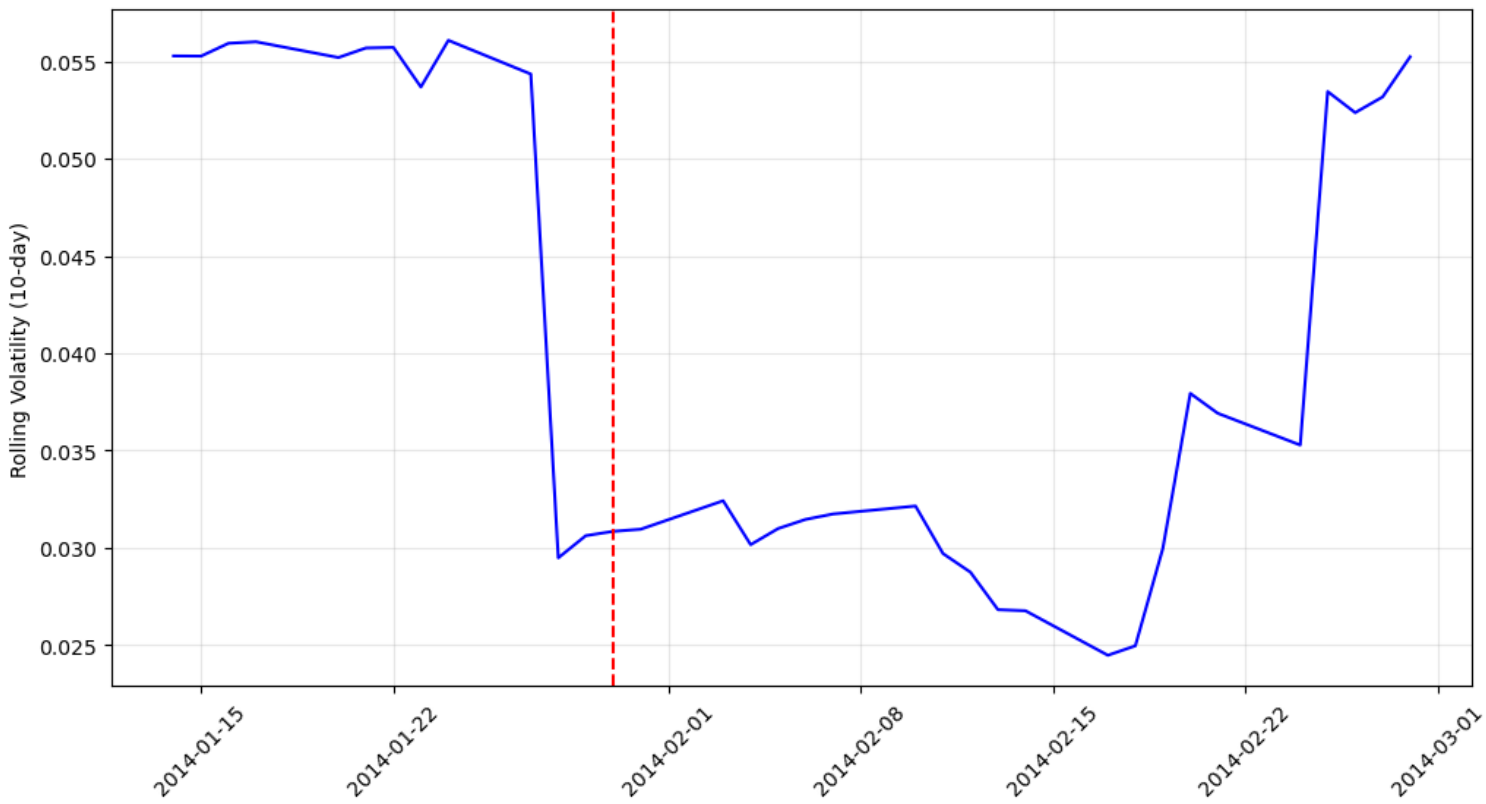


Figure: Tesla Stock Volatility around Model S P85D Announcement

# Model

- Very naive linear model:

$$\text{Rolling_Volatility}_{it} = \alpha + \beta \cdot \text{Announcement}_{it} + \epsilon_{it}$$

- Binary independent variable but too few observations.
- Absence of control variables to prevent biases.

# Results

| Parameter | Value |
|---|---|
| Intercept | 0.019317437887891822 |
| Coefficient for Announcement_Binary | 0.0019166839158981386 |
| $R^2$ Score | -0.0005099587924510818 |

Table: Regression Results

# Conclusion

- Limitations & Future Improvements
- Business Implications

# Conclusion: Limitations & Future Improvements

- Hard to know where the impact exactly takes place: for example, is it when the product is announced or released?
- Finding control variables is not easy but factors such as changes in interest rates, geopolitical events, and general economic conditions could have a significant impact on volatility and affect product announcements of firms.
- Asymmetry between stock returns computed daily and products announced only several times in a year.
- Is rolling volatility a good measure in our case? Window size?
- Trade-off between interesting subjects and data accessibility.

# Conclusion: Business Implications

- Investors need to consider a broader range of factors beyond announcements when evaluating stock price movements.
- Companies can focus on product strategy and innovation without excessive concern for short-term market reactions.
- Our findings challenge the logical assumption that major product announcements significantly affect stock behavior, emphasizing the importance of a more comprehensive approach when analyzing market dynamics.