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

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Introduction: Theme

- Why did we choose this topic ?

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- We are 4 students studying finance who are interested in stock market prices.
- 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 in the tech industries such as Apple, Amazon, Tesla etc...
- Because stock volatility is a key metric for understanding market risk.

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- As everything was new for us, we first started by watching a YouTube video about what GitHub was...
- We successfully found out how to do our first commits and add files on GitHub (git push, git clone, etc...)

Introduction

```
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: Successful git push command.

Introduction: Repository

1. README.md

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2. requirements

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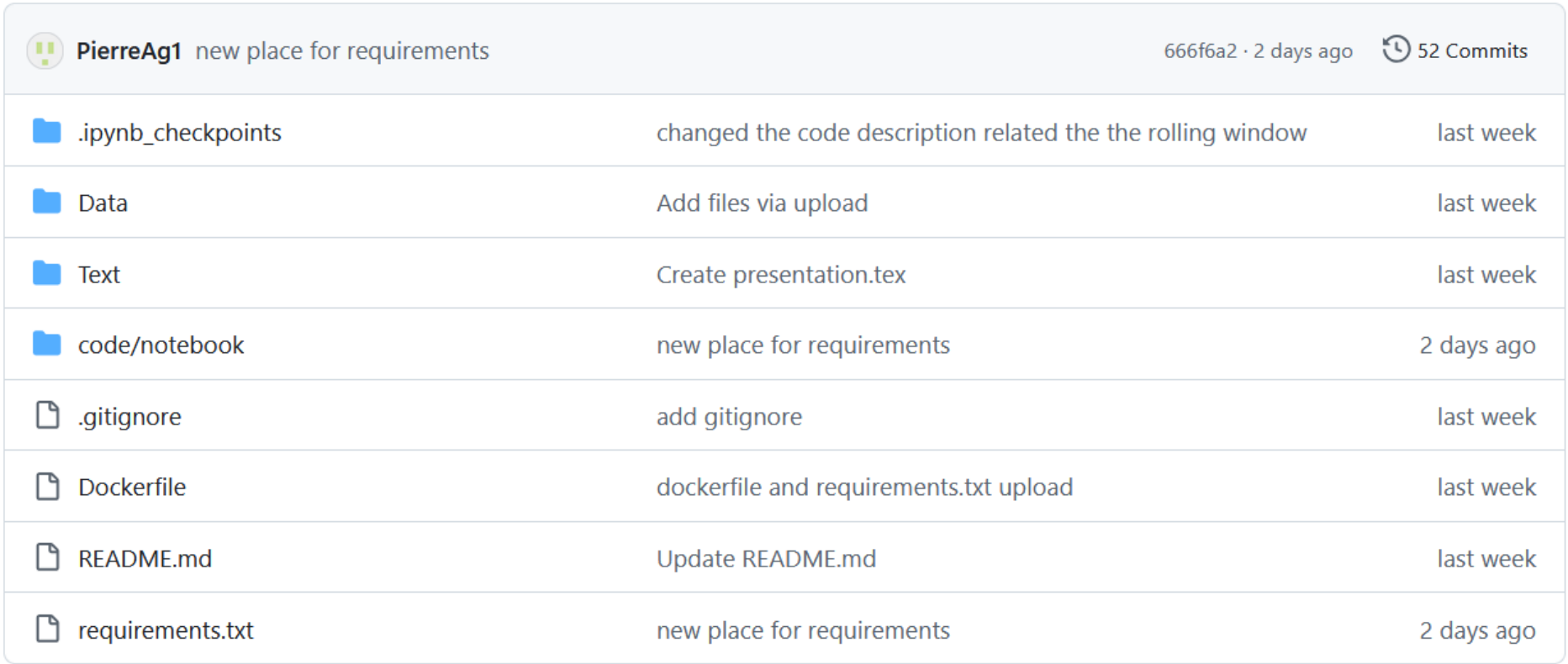
Introduction



PierreAg1 new place for requirements	666f6a2 · 2 days ago	52 Commits
.ipynb_checkpoints	changed the code description related the the rolling window	last week
Data	Add files via upload	last week
Text	Create presentation.tex	last week
code/notebook	new place for requirements	2 days ago
.gitignore	add gitignore	last week
Dockerfile	dockerfile and requirements.txt upload	last week
README.md	Update README.md	last week
requirements.txt	new place for requirements	2 days ago

Figure: Our repository on GitHub.

Data importation, merging and cleaning

- After that we had to find data to work with

Data Processing

- Key datasets:
  - Company announcements dataset.
  - Daily stock prices dataset.
- Key pre-processing steps:
  - Cleaning column names.
  - Converting date formats.
  - Merging stock prices with announcement data.

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 Cleaning Example

	Name	Date	Announcement	StockPrice
0	AMZN	2013-12-31	NaN	20363.73
1	AMZN	2014-01-01	NaN	20363.73
2	AMZN	2014-01-02	NaN	20321.87
3	AMZN	2014-01-03	NaN	20243.74
4	AMZN	2014-01-06	NaN	20100.25

Figure: Data frame after cleaning process.

Data Cleaning Example

- We removed every negative values, missing values and zero values

```
    print(missing_values)
    print(zero_values)
    print(negative_values)
 ✓  0.0s
Name                0
Date                0
Announcement    25970
StockPrice          0
dtype: int64
Empty DataFrame
Columns: [Name, Date, Announcement, StockPrice]
Index: []
Empty DataFrame
Columns: [Name, Date, Announcement, StockPrice]
Index: []
```

Figure: Results of any missing, zero, negative values.

Compute daily returs & rolling volatility

- After the data cleaning process, we computed the daily returns and the rolling volatility for each stock

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	Daily_Return		Rolling_Volatility	
	mean	std	mean	std
Name				
AMZN	0.001008	0.020572	0.297468	0.137421
APPL	0.001087	0.017588	0.252589	0.121144
AVGO	0.001501	0.021550	0.313555	0.141604
GOOG	0.000776	0.017279	0.251213	0.115213
META	0.001001	0.023150	0.325019	0.177339
MSFT	0.001113	0.016755	0.239529	0.122611
NVDA	0.002308	0.028763	0.413733	0.195490
TECHY	0.000704	0.021892	0.319505	0.136987
TSLA	0.001783	0.034369	0.500945	0.213008
TSMC	0.000910	0.016182	0.243874	0.081671

Figure: Results of daily return & rolling volatility.

Compute daily returs & rolling volatility

- Daily returns calculated using percentage change.
- Rolling volatility computed using a 10-day window.

Descriptive analysis

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- With this clean data frame we can now plot different graphics
- The announcements are represented by vertical lines on the graphic
- The next slides shows the different graphics (with different firms and different time frames).

Descriptive analysis

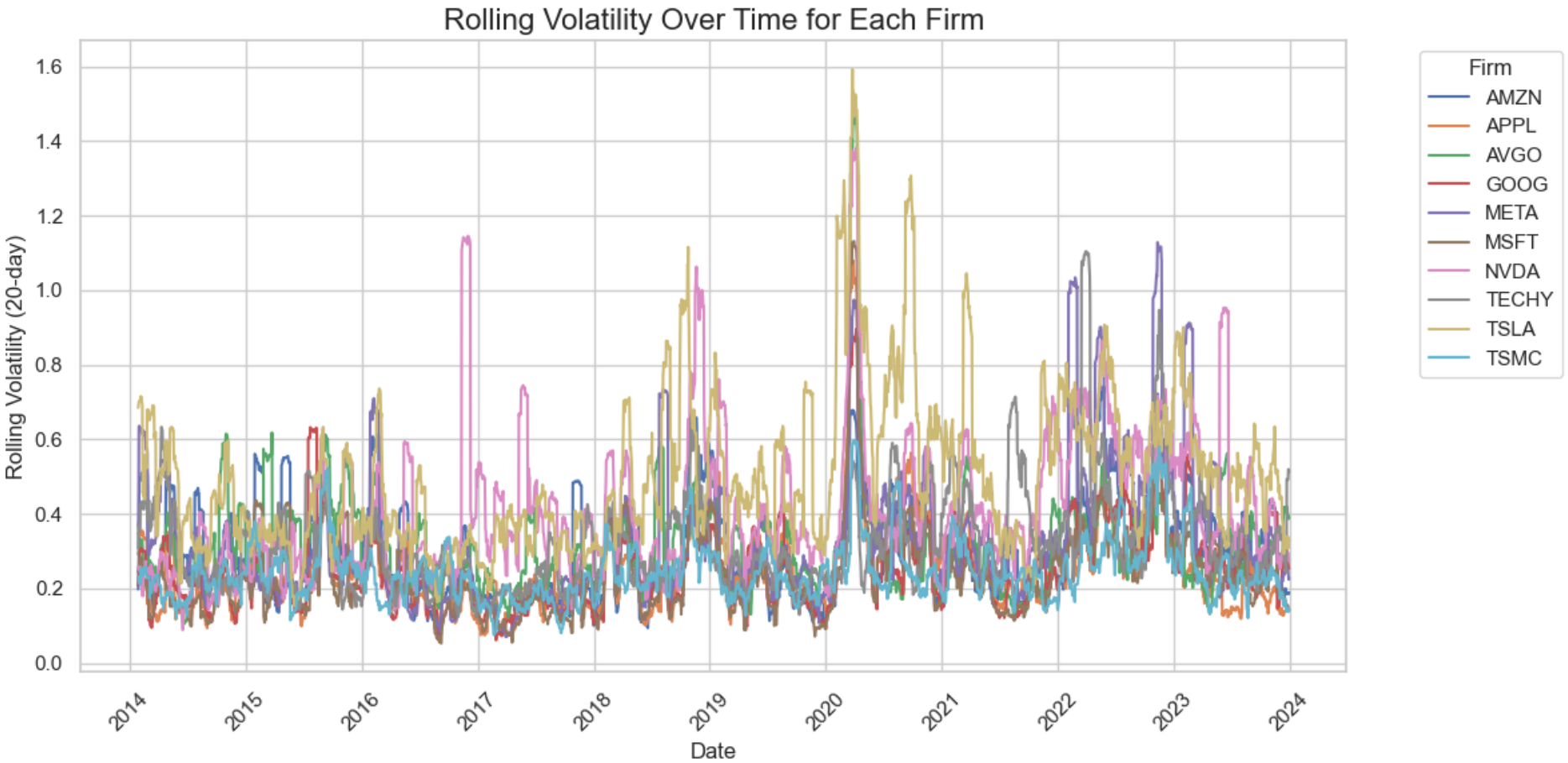

Figure: All stock prices between 2014 and 2024.

Rolling Volatility Visualization

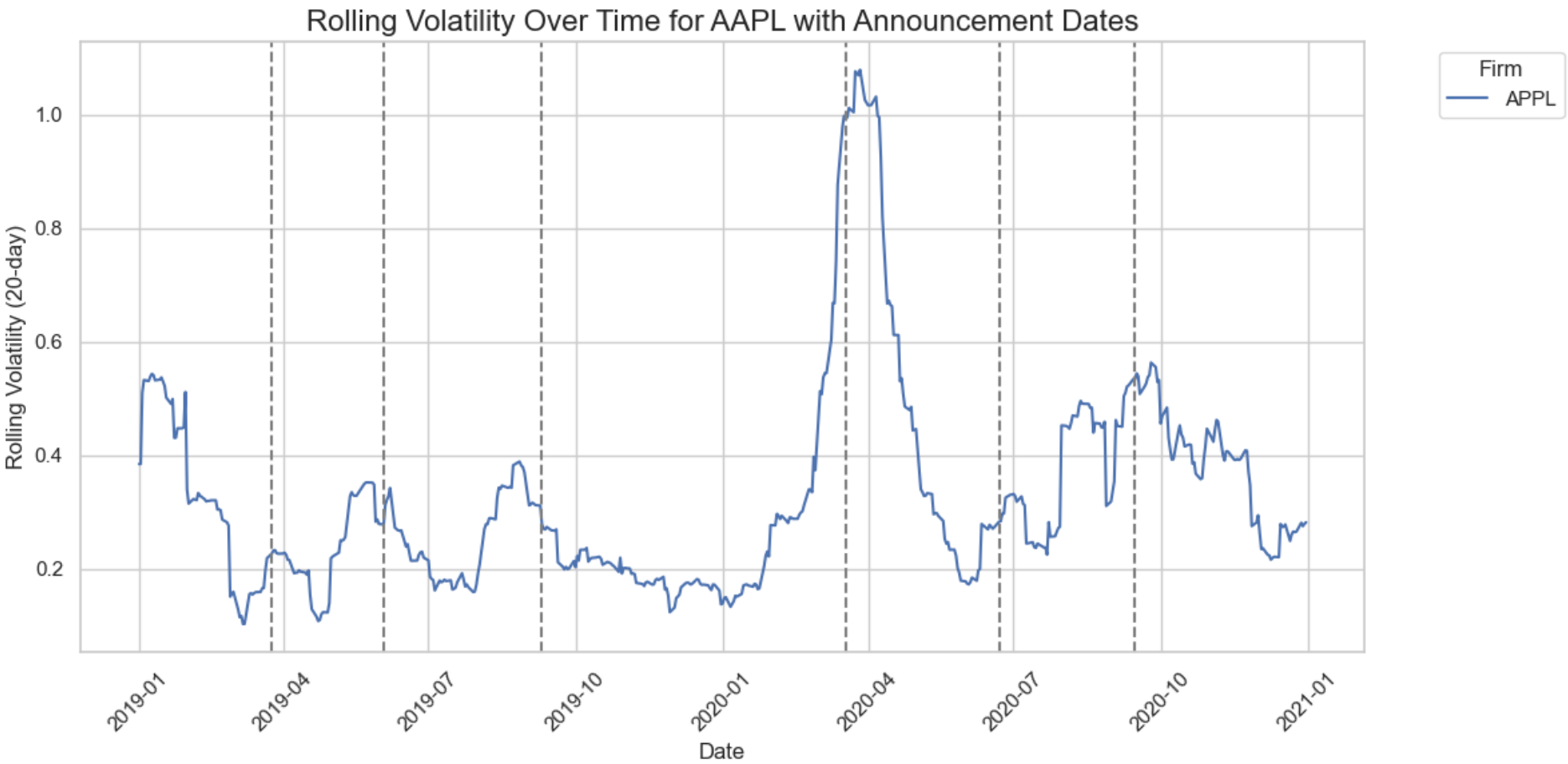

Figure: APPL stock price between 2019 and 2020.

Results

- Pre- and post-announcement volatility changes were computed.
- Average changes in 10-day rolling volatility due to announcements:
  - Significant increases observed for Company A.
  - No significant change for Company B.

Linear Regression Results

- A binary variable for announcements was introduced.
- Regression results:
  - Intercept: `value from your notebook`.
  - Coefficient: `value from your notebook`.
- R-squared: `value from your notebook`.

Conclusion

- Volatility analysis provides insights into market reactions to company announcements.
- This project combines data processing, statistical analysis, and visualization.
- Future work:
  - Expand analysis to include more companies.
  - Improve modeling techniques to predict volatility more precisely.

Bibliography