

Twitter & share prices

Impact of CEO Tweets on stock prices using Sentiment Analysis

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Is there a basis for the so-called “Elon Effect”?

Social media could be construed as a proxy for public sentiment and opinion about current events. Some studies have shown that the aggregate public mood collected from Twitter could be correlated with Dow Jones Industrial Average Index (DJIA).

We will analyse if tweets of company CEO's are correlated with changes in stock prices.



TSLA -5%



TSLA +5%

Fly



Jack Dorsey

9:45 AM (0 minutes ago) ☆ ↩ ⋮

to Twitter

Hello team.

After almost 16 years of having a role at our company...from co-founder to CEO to Chair to Exec Chair to interim-CEO to CEO...I decided it's finally time for me to leave. Why?

There's a lot of talk about the importance of a company being "founder-led." Ultimately I believe that's severely limiting and a single point of failure. I've worked hard to ensure this company can break away from its founding and founders. There are 3 reasons I believe now is the right time.

The first is Parag becoming our CEO. The board ran a rigorous process considering all options and unanimously appointed Parag. He's been my choice for some time given how deeply he understands the company and its needs. Parag has been behind every critical decision that helped turn this company around. He's curious, probing, rational, creative, demanding, self-aware, and humble. He leads with heart and soul, and is someone I learn from daily. My trust in him as our CEO is bone deep.

The second is Bret Taylor agreeing to become our board chair. I asked Bret to join our board when I became CEO, and he's been excellent in every way. He understands entrepreneurship, taking risks, companies at massive scale, technology, product, and he's an engineer. All of the things the board and the company deserve right now. Having Bret in this leadership role gives me a lot of confidence in the strength of our board going forward. You have no idea how happy this makes me!

The third is all of you. We have a lot of ambition and potential on this team. Consider this: Parag started here as an engineer who cared deeply about our work and now he's our CEO (I also had a similar path...he did it better!). This alone makes me proud. I know that Parag will be able to channel this energy best because he's lived it and knows what it takes. All of you have the potential to change the course of this company for the better. I believe this with all my heart!

Parag is CEO starting today. I'm going to serve on the board through my term (May-ish) to help Parag and Bret with the transition. And after that...I'll leave the board. Why not stay or become chair? I believe it's really important to give Parag the space he needs to lead. And back to my previous point, I believe it's critical a company can stand on its own, free of its founder's influence or direction.

I want you all to know that this was my decision and I own it. It was a tough one for me, of course. I love this service and company...and all of you so much. I'm really sad...yet really happy. There aren't many companies that get to this level. And there aren't many founders that choose their company over their own ego. I know we'll prove this was the right move.

We'll have an all-hands meeting tomorrow at 9:05 AM Pacific to discuss it all. Until then, thank you all for the trust you've placed in me, and for the openness to build that trust in Parag and yourselves. I love you all.

jack

PS I'm tweeting this email. My one wish is for Twitter Inc to be the most transparent company in the world. Hi mom!

TWTR -4%

Methodology Used

Twitter and impact on share prices

Approach & methodology

1. Twitter API: Fetching Tweets of company CEOs
2. Stock prices of publicly listed companies (yahoo finance)
3. Data cleaning
4. TextBlob or VADER for Sentiment Analysis
5. WordCloud
6. Regression analysis
7. Conclusions

Our process

Getting the Data

Using the Twitter API to download tweets of company CEOs

Downloading CSV files of stock prices on Yahoo Finance

Cleaning the Data

Using Pandas to import all data as DataFrames

Using basic functions to clean up tweets

Merging DataFrames

Applying Sentiment Analysis

Applied TextBlob on Tweet DataFrames

Getting an extra column with a "sentiment score"

Using Word Clouds

Obtained WordClouds for each CEO

Statistical Analysis

T-test

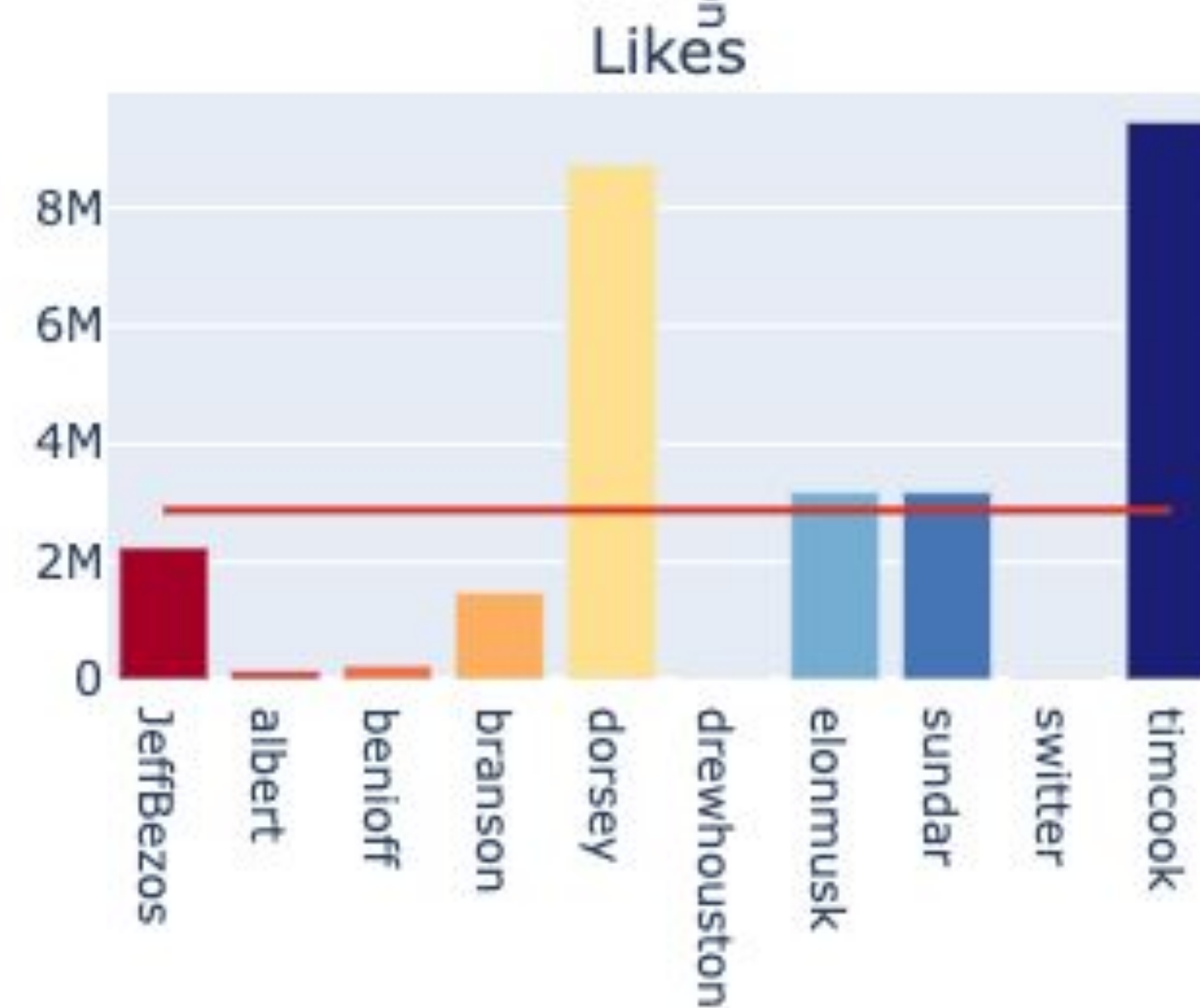
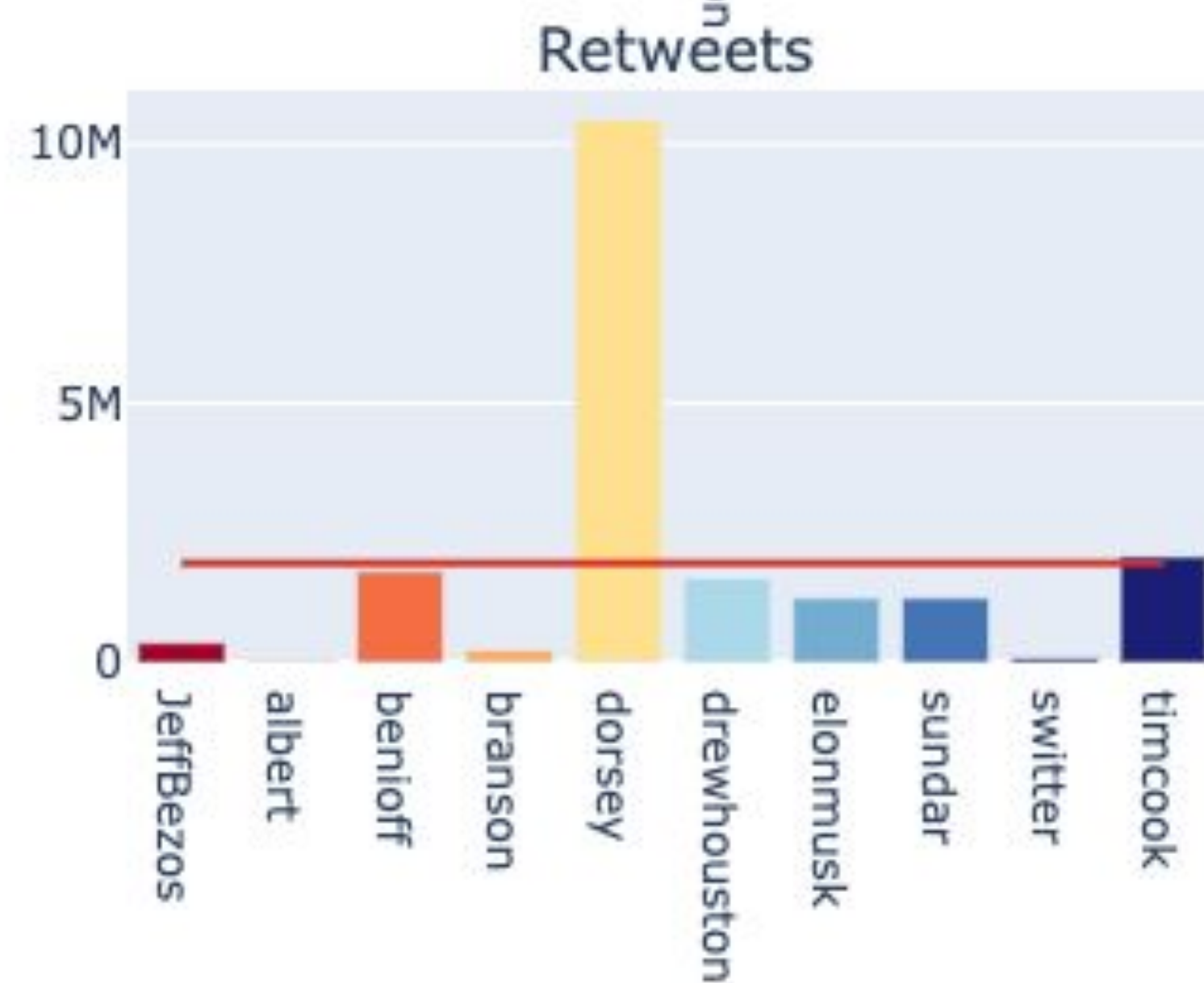
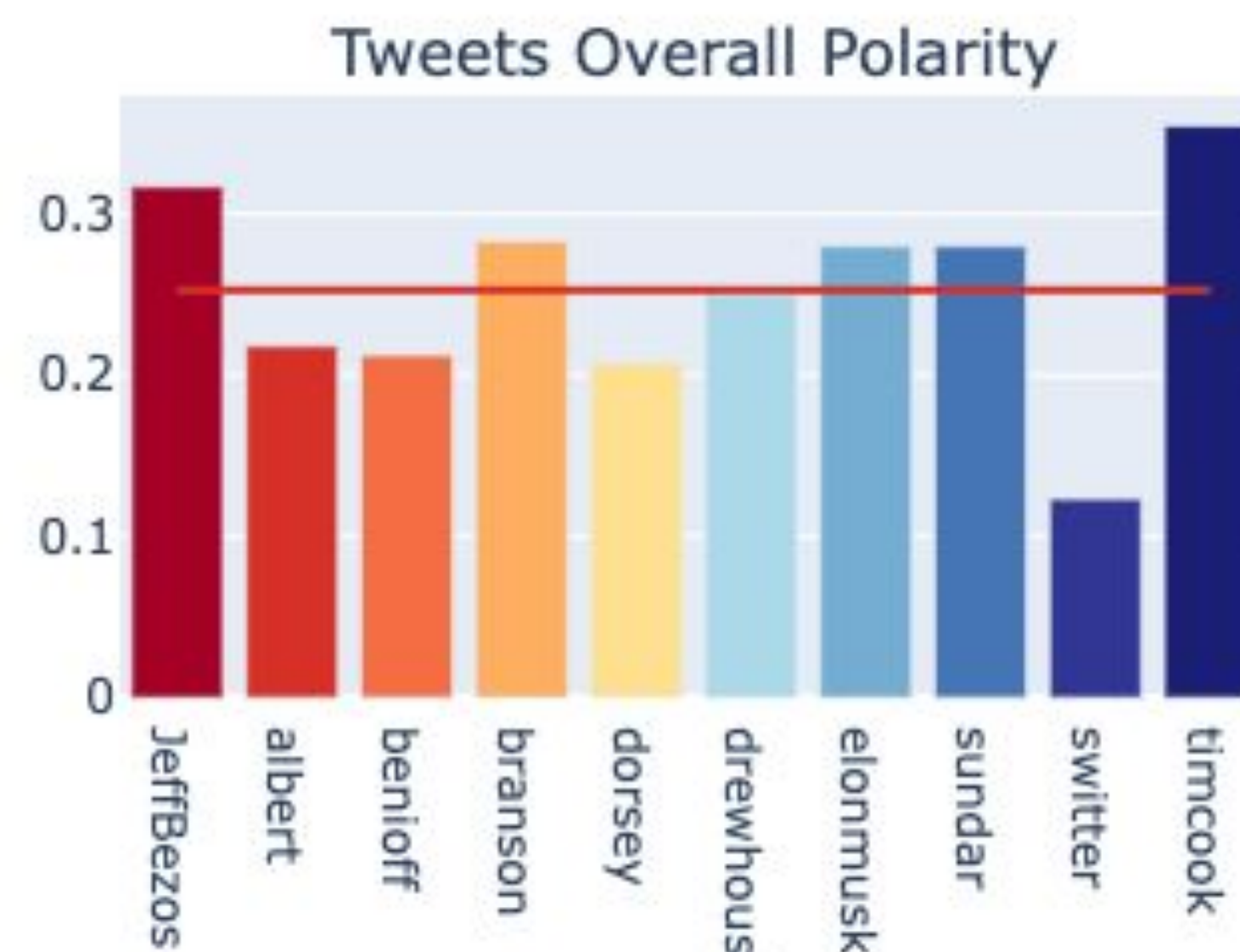
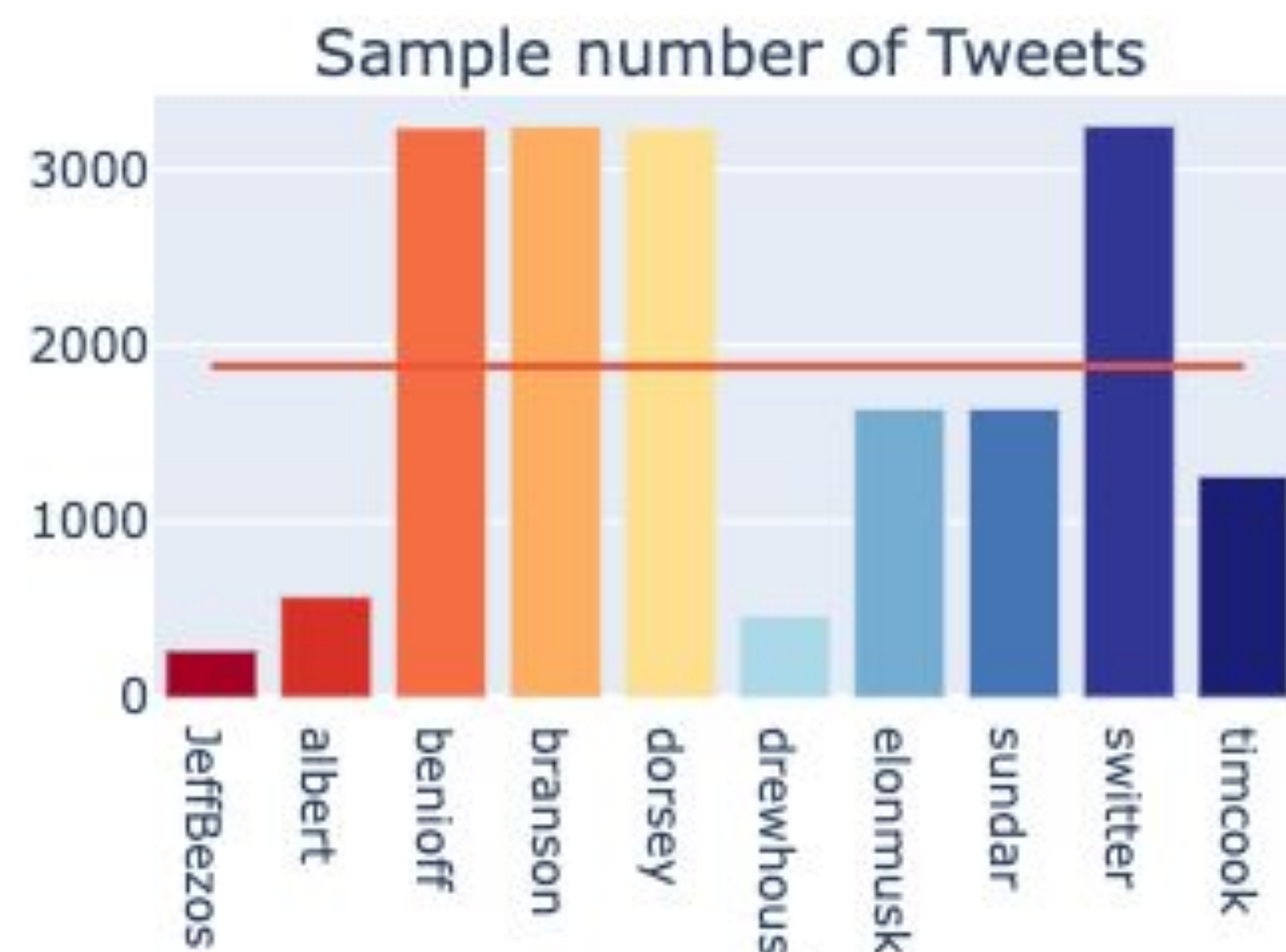
Correlation matrix: using Pearson correlation coefficient and Spearman correlation coefficient

Simple Linear Regression model

Multiple linear regression model

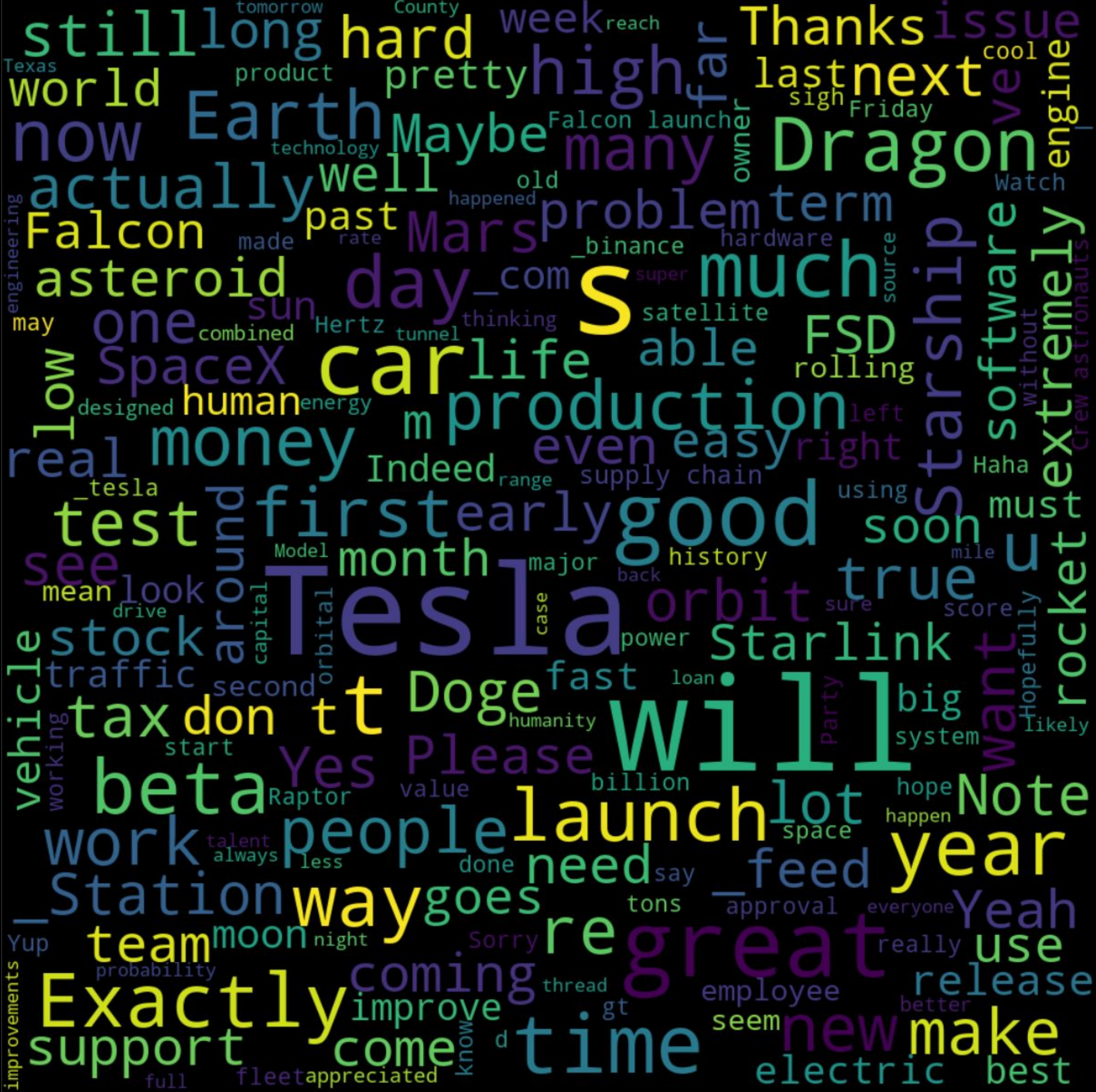
CEOs Twitter Activity

CEOs Activity on Twitter



WordClouds

Elon Musk - Tesla



[illegible]

[illegible]

Tim Cook - Apple



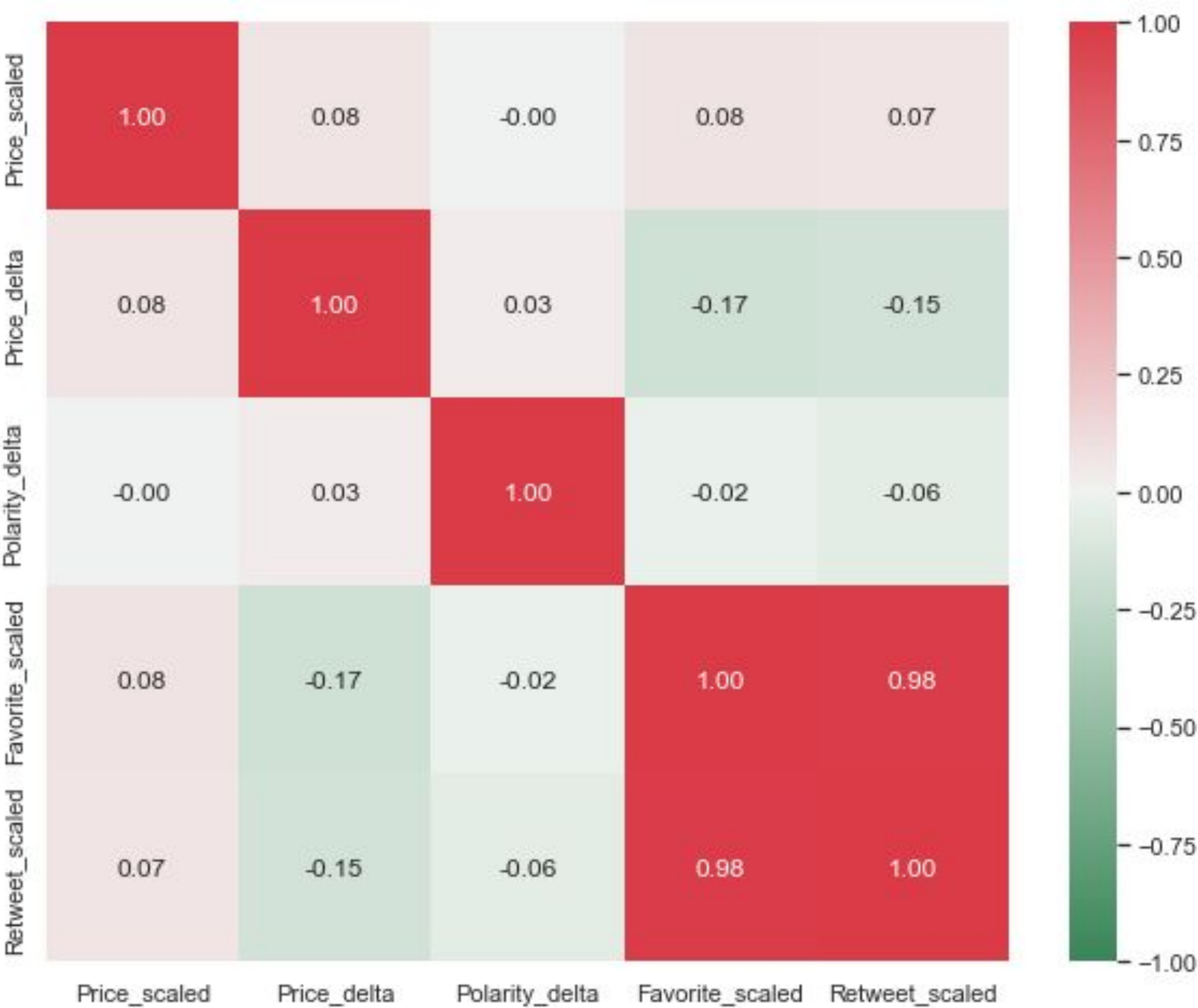
Russian Trader - Wheat



Data Analysis

Richard Branson tweets - Virgin Galactic stock price

H0: the changes in stock market prices are similar **on average** compared to the changes in CEO's Twitter sentiment



R-squared:	0.034
Adj. R-squared:	0.030
F-statistic:	8.504
Prob (F-statistic):	1.48e-05
=====	
	coef std err t P> t

const	0.0007 0.001 0.633 0.527
Retweet_scaled	0.2463 0.141 1.748 0.081
Polarity_delta	0.0086 0.008 1.104 0.270
Favorite_scaled	-0.3829 0.143 -2.683 0.007

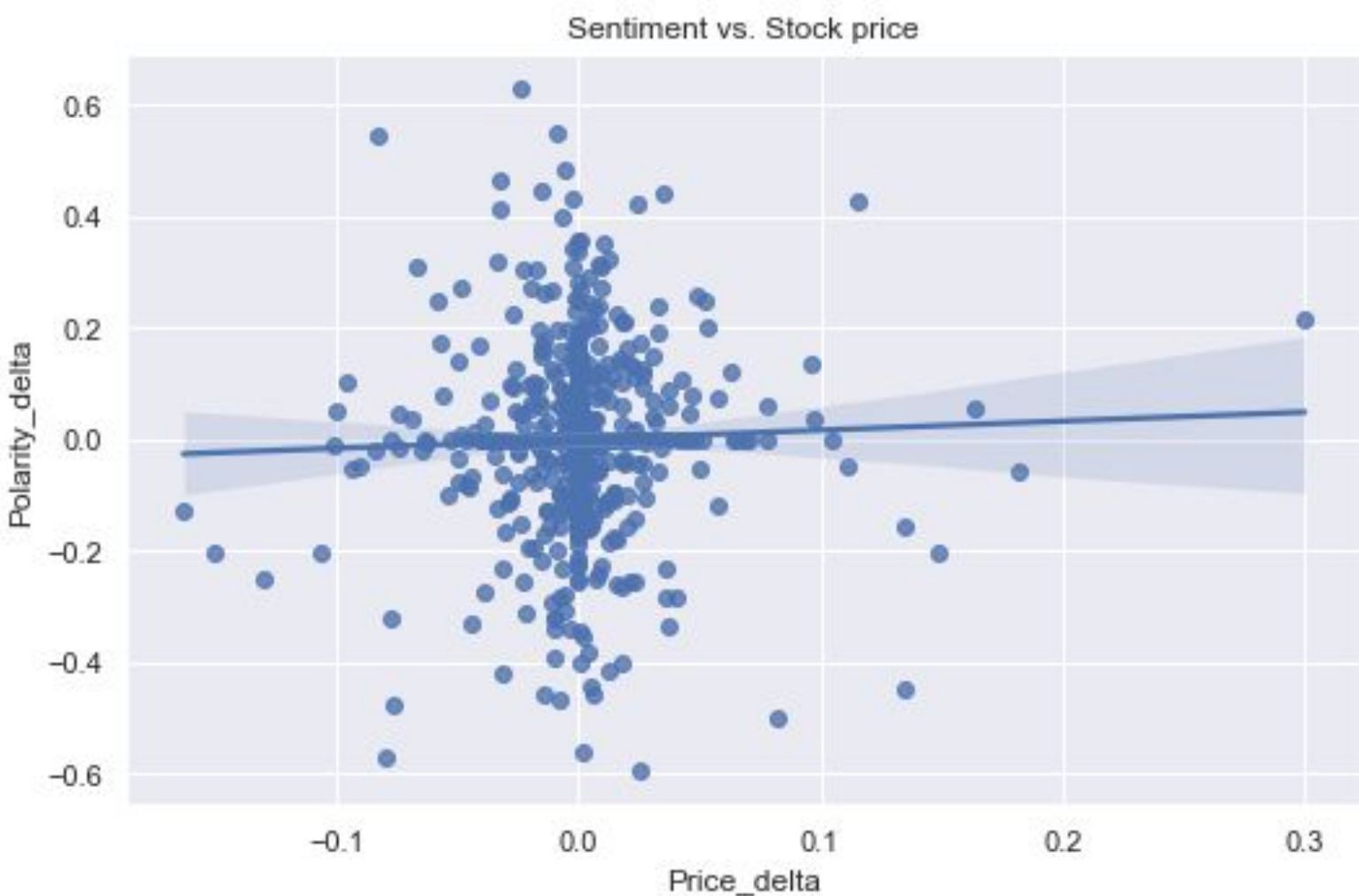
T-test: the p-value was larger than the significance level of 5%

Correlation matrix: using Pearson correlation coefficient and Spearman correlation coefficient - no correlation

Simple Linear Regression model: no significant coefficients (based on their p-values) and R squared approximately equal to zero

Multiple linear regression model: **F-test** of overall significance, concludes that our model is better compared to a model with no independent variables, the **t-test** for each coefficient returns only one significant coefficient, **the number of likes per tweet**; low coefficient of determination

Sentiment vs. Stock price

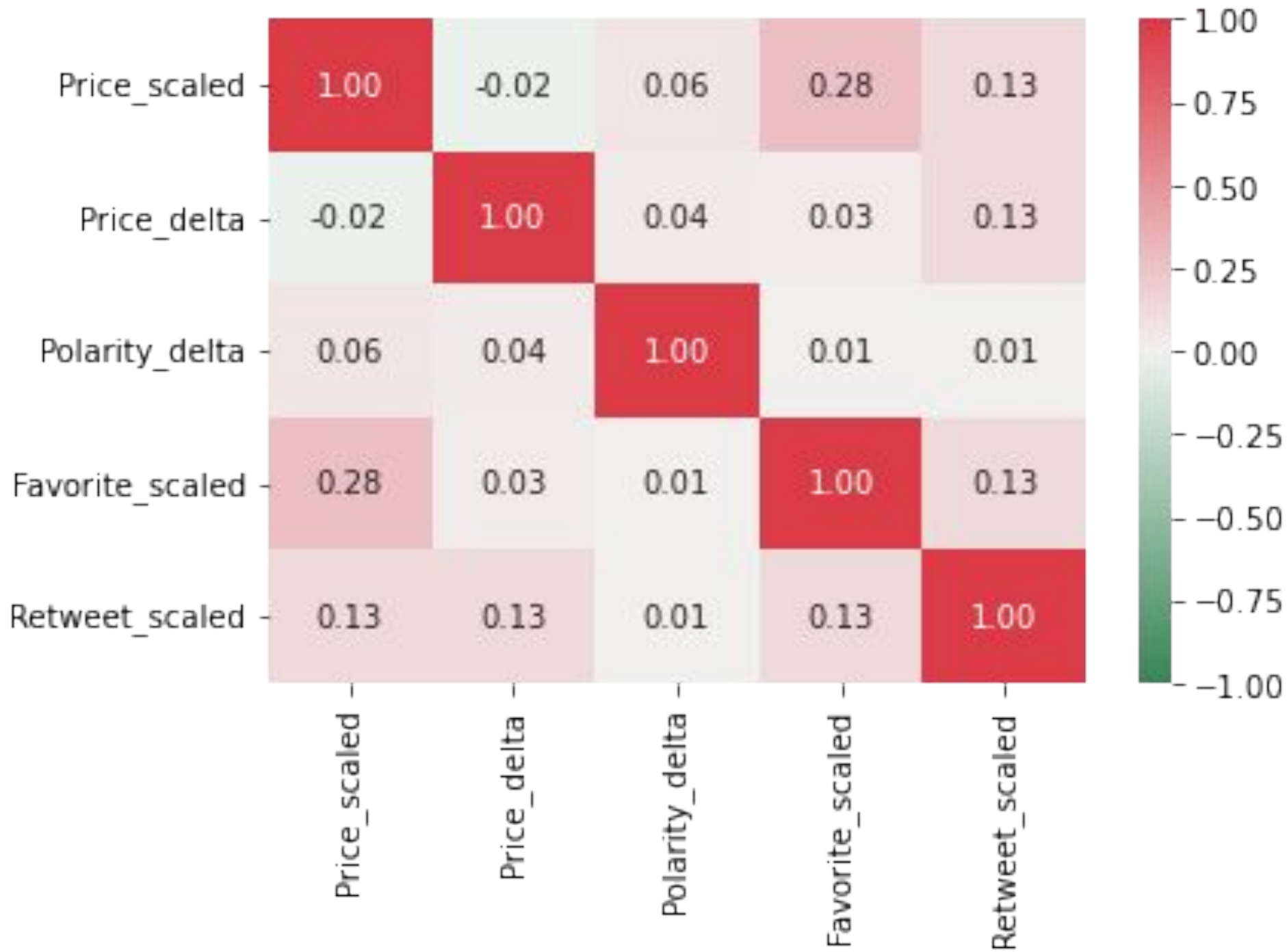


No correlation found when analysing CEO's Twitter accounts and their companies' stock prices evolution...

So who does influence the markets?

Twitter™ tweets - MATIF Milling Wheat price

*H0: the changes in wheat prices are similar **on average** compared to the changes in the commodities trader influencer's Twitter sentiment*



R-squared: 0.089
Adj. R-squared: 0.075
F-statistic: 6.210
Prob (F-statistic): 0.000478

	coef	std err	t	P> t
const	0.2715	0.027	9.958	0.000
Retweet_scaled	0.3059	0.220	1.391	0.166
Polarity_delta	0.0852	0.150	0.568	0.571
Favorite_scaled	0.3627	0.095	3.835	0.000

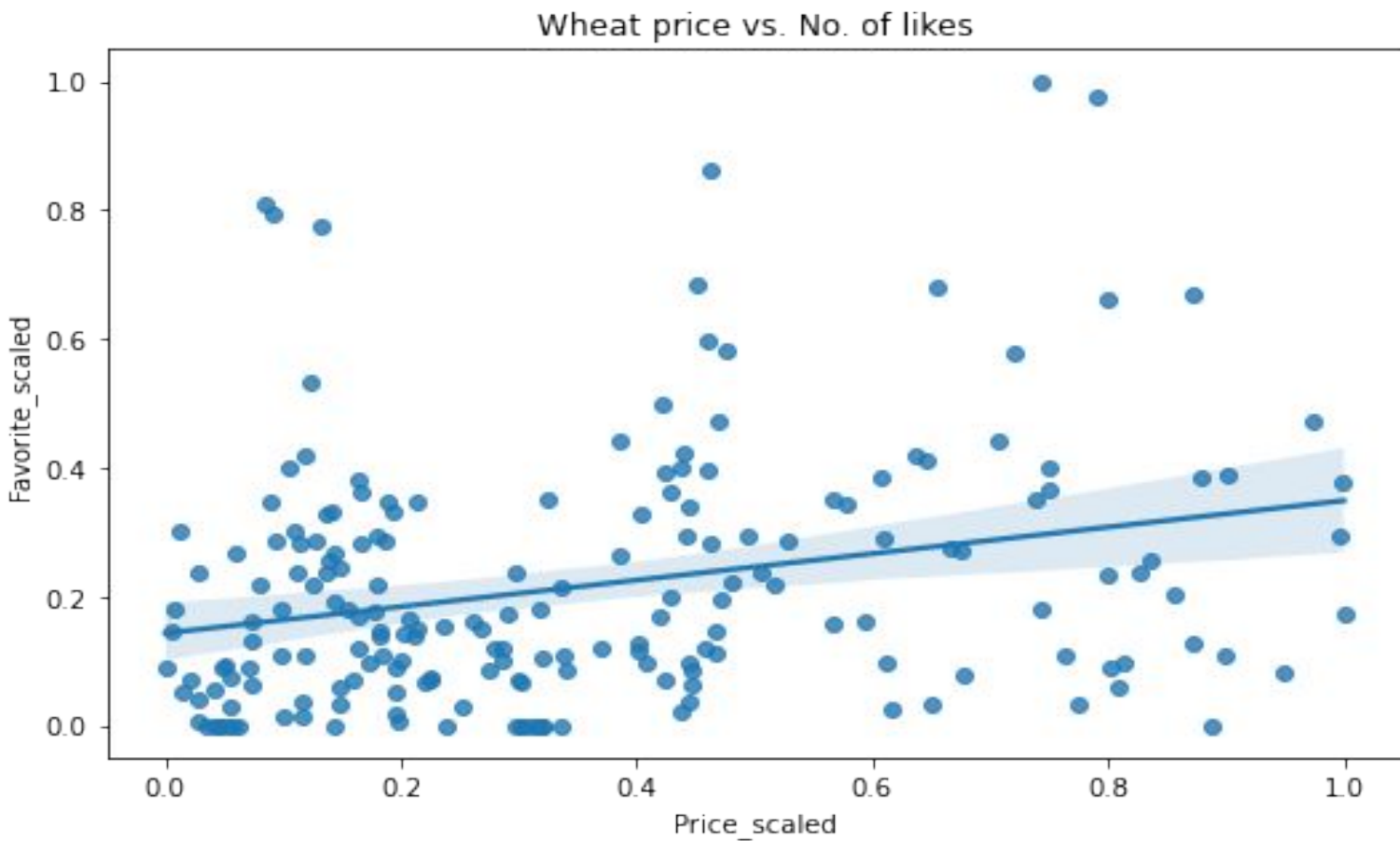
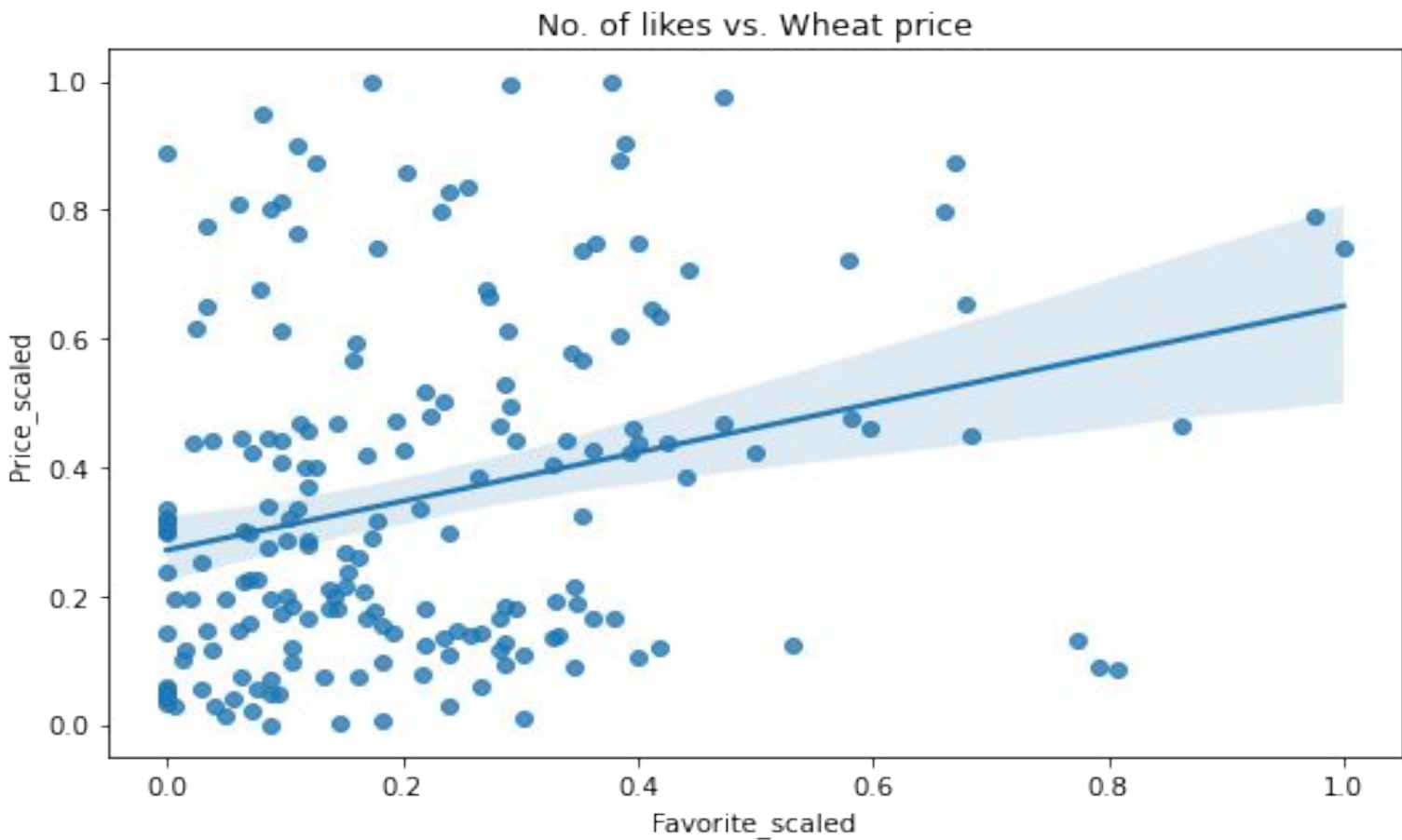
T-test: the p-value was larger than the significance level of 5%

Correlation matrix: there is a positive correlation between the number of likes per Tweet and the price of wheat - the strength of a linear relationship between those two variables is **0.28**

Simple Linear Regression model: dependent variable: price of wheat, independent variable: no. of likes per tweet, significant coefficient based on its p-value, R squared approximately equal to 0.078, Adj. R-squared 0.073

Multiple linear regression model: **t-test** for each coefficient returns only one significant coefficient - **the number of likes per tweet**, the coefficient of determination, which measures the proportion of the variation in the dependent variable that is predictable from the independent variables is 0.089

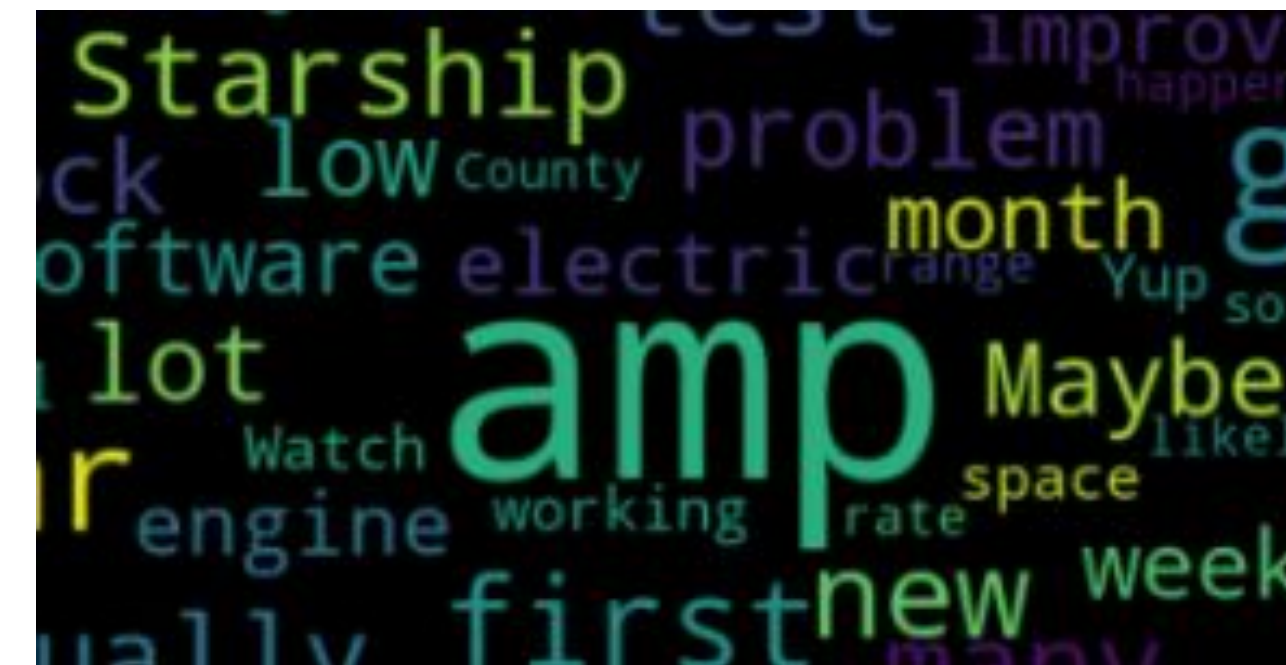
No. of likes vs. Wheat price



Conclusions

Issues encountered

- Random amount of tweets from Elon Musk's Twitter account
- Limited sample size (last ~3200 Tweets per account)
(biased samples)
- Recurring & in Workcloud
- Heterogeneous mix of personal and professional tweets



Conclusion

- Tweets of CEO's have **no correlation** to their respective companies' stock prices
- For tweets which impact markets look for **Twitter influencers** in different sectors (commodities, real-estate, etc.)

Thank you for your attention