Tesla and Lucid

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Background: Tesla

- Tesla is an automotive company that is known for manufacturing electrical vehicles, battery energy storage devices, and other sustainable energy products
- Tesla was founded in 2003 and their first EV was the Roadster
- Business wise, their most recent models aim to be priced lower to attract a higher volume market
    - develops many components in-house, such as batteries, motors, and software
    - do not rely on franchised dealerships to sell vehicles.

“We’re building a world powered by solar energy, running on batteries and transported by electric vehicles.”-About Us section on the Tesla Website

Background: Lucid Motors

- Founded in 2007 by a former Tesla Vice President with the focused on building electric vehicle batteries and powertrains for other vehicle manufacturers
- Formerly known as Atieva and rebranded as Lucid in 2016
- New focus was to develop an all-electric, high-performance luxury vehicle.

Introduction: Why our Project is necessary

- Controversies and criticism
  - Regarding Tesla vehicles safety
  - Autopilot system was designed to reduce the risk of accidents.
  - But there is an argument that the autopilot is flawed and poses a risk to drivers and other road users

With this in mind, we aim to gain insights into the relationship between accidents and stock prices (their business success), and compare the progress of Lucid (another EV company) relative to Tesla stock prices during their respective developmental stages.

NHTSA Shares ADAS Crash Data And It Puts Tesla In A Bad Light

Almost 70 percent of all Level 2 semi-autonomous driving crashes from 2021 that the NHTSA in the US involved Teslas.

17 fatalities, 736 crashes: The shocking toll of Tesla's Autopilot

Tesla's driver-assistance system, known as Autopilot, has been involved in far more crashes than previously reported

By Faiz Siddiqui and Jeremy B. Merrill
June 10, 2023 at 7:00 a.m. EDT

Tesla's self-driving technology fails to detect children in the road, group claims

Tesla's 'phantom braking' problem is getting worse, and the US government has questions

Methods

- Obtaining our data from various sources
- Cleaning the data
- Combining datasets for various analysis
- Exploratory analysis
- Visualization
- Rolling mean Average and Simulation
- Built dashboard

Obtaining data

Stock prices for Lucid and Tesla from NASDAQ

*1st time point is when the company first became public

TSLA > TSLA HISTORICAL DATA

TSLA Historical Data

1M 6M YTD 1Y 5Y MAX DOWNLOAD DATA

Date	Close/Last	Volume	Open	High	Low
11/07/2023	$222.18	116,900,100	$219.98	$223.12	$215.72
11/06/2023	$219.27	117,335,800	$223.98	$226.32	$215.00
11/03/2023	$219.96	119,534,800	$221.15	$226.3701	$218.40
11/02/2023	$218.51	125,987,600	$212.97	$219.20	$211.45
11/01/2023	$205.66	121,661,700	$204.04	$205.99	$197.85

Date	Tesla_Close	Tesla_Volume	Tesla_Open	Tesla_High	Tesla_Low	Lucid_Close	Luci
2023-11-03	219.9600	119534800	221.1500	226.3701	218.4000	4.62	3
2023-11-02	218.5100	125987600	212.9700	219.2000	211.4500	4.54	4
2023-11-01	205.6600	121661700	204.0400	205.9900	197.8500	4.05	2
2023-10-31	200.8400	118068300	196.1200	202.8000	194.0700	4.12	2
2023-10-30	197.3600	136448200	209.2800	210.8800	194.6700	4.07	1

Case #	Year	Date	Country	State	Description
364	2023	9/30/2023	USA	CA	Tesla hits pole
363	2023	9/25/2023	USA	VA	Rear-end car crash
361	2023	9/24/2023	USA	PA	Collision
360	2023	9/4/2023	USA	VA	Motorcycle and Tesla head-on collide
359	2023	9/1/2023	USA	ID	Tesla crosses center line and hits oncoming car
358	2023	8/29/2023	USA	TX	Tesla crashes into wall of hospital
357	2023	8/13/2023	USA	NJ	Motorcycle hits Tesla
356	2023	8/12/2023	Germany	-	Tesla hits guardrail and burns
355	2023	8/12/2023	USA	CA	Multi-car accident involving semi
354	2023	8/1/2023	USA	CA	Motorcycle hits Tesla
353	2023	7/31/2023	USA	TX	Hit and run
352	2023	7/29/2023	USA	UT	Tesla crashes into tree, burns
351	2023	7/29/2023	USA	TX	Tesla crashes into tree, burns
350	2023	7/22/2023	USA	NC	Tesla crashes into trees
349	2023	7/21/2023	USA	VA	Tesla crashes into side of truck
348	2023	7/20/2023	USA	CA	Multi-car accident
346	2023	7/16/2023	USA	FL	Tesla runs off road and crashes into pole
345	2023	7/8/2023	USA	MN	Speeding Tesla crashes into minivan
344	2023	7/8/2023	USA	CA	Tesla crashes in parking lot
343	2023	7/8/2023	Germany	-	Tesla crashes into trees
342.2	2023	7/7/2023	USA	CA	Tesla hits fire hydrant and burns
342.1	2023	7/7/2023	USA	CA	Multi Car accident involving DUI
342	2023	7/5/2023	USA	CA	Collision
341	2023	7/4/2023	USA	FL	Tesla crashes into divider
340	2023	7/1/2023	Italy	-	Tesla drives into opposite lane

LCID > LCID HISTORICAL DATA

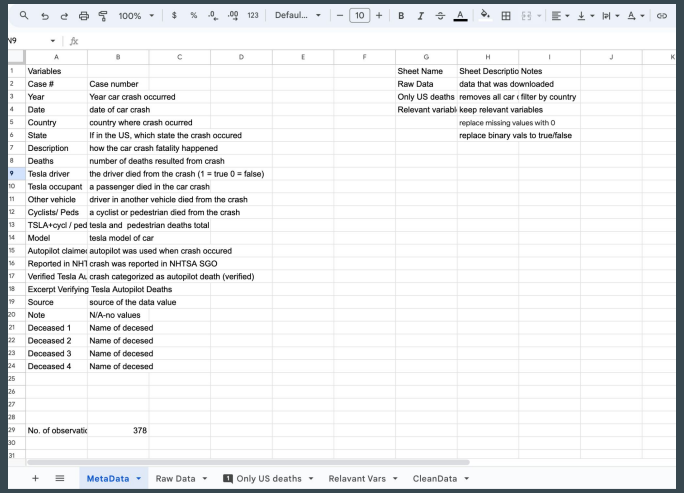
LCID Historical Data

1M 6M YTD 1Y 5Y MAX DOWNLOAD DATA

Date	Close/Last	Volume	Open	High	Low
11/07/2023	$4.30	25,579,480	$4.33	$4.345	$4.21
11/06/2023	$4.32	25,136,020	$4.71	$4.71	$4.25
11/03/2023	$4.62	32,179,100	$4.66	$4.85	$4.55
11/02/2023	$4.54	47,135,750	$4.13	$4.615	$4.12
11/01/2023	$4.05	21,911,580	$4.13	$4.14	$3.96

Data Cleaning

- Data set with Tesla fatal car crashes was cleaned in Google sheets and was done to remove irrelevant variables and cases, replace missing values with 0 or NA, and replace binary values with True/False
- Stock market dataset-remove $, make each value numeric, and transform dates into Date objects



	A	B	C	D	E	F	G	H	I	J
1	Variables						Sheet Name	Sheet Descriptio	Notes	
2	Case #	Case number					Raw Data	data that was downloaded		
3	Year	Year car crash occurred					Only US deaths	removes all car c	filter by country	
4	Date	date of car crash					Relevant variabl	keep relevant variables		
5	Country	country where crash ocurred						replace missing values with 0		
6	State	If in the US, which state the crash occured						replace binary vals to true/false		
7	Description	how the car crash fatality happened								
8	Deaths	number of deaths resulted from crash								
9	Tesla driver	the driver died from the crash (1 = true 0 = false)								
10	Tesla occupant	a passenger died in the car crash								
11	Other vehicle	driver in another vehicle died from the crash								
12	Cyclists/ Peds	a cyclist or pedestrian died from the crash								
13	TSLA+cycl / ped	tesla and pedestrian deaths total								
14	Model	tesla model of car								
15	Autopilot claime	autopilot was used when crash occured								
16	Reported in NH1	crash was reported in NHTSA SGO								
17	Verified Tesla Au	crash categorized as autopilot death (verified)								
18	Excerpt Verifying	Tesla Autopilot Deaths								
19	Source	source of the data value								
20	Note	N/A-no values								
21	Deceased 1	Name of deceased								
22	Deceased 2	Name of deceased								
23	Deceased 3	Name of deceased								
24	Deceased 4	Name of deceased								
25										
26										
27										
28										
29	No. of observatic	378								
30										
31										

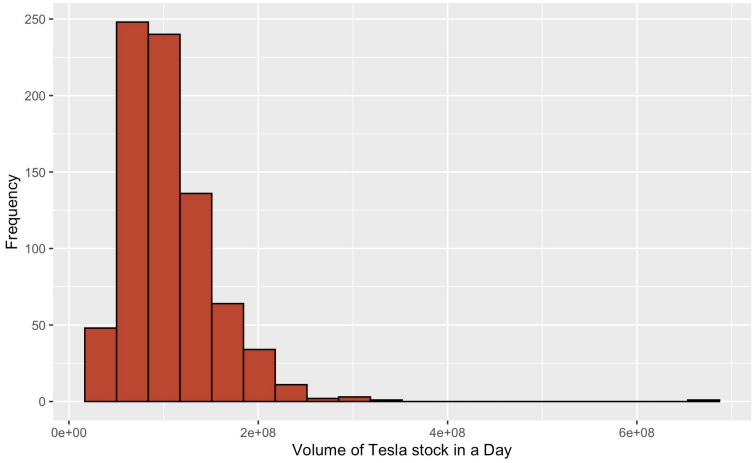
MetaData | Raw Data | Only US deaths | Relavant Vars | CleanData

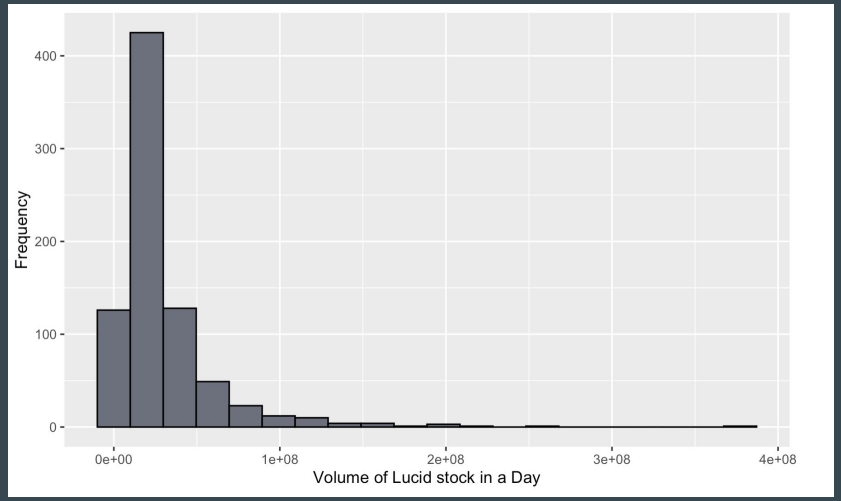
```r
# Remove the $ in the dataset
tesla_stock$Close.Last <- gsub("\\$", "", tesla_stock$Close.Last)
tesla_stock$Open <- gsub("\\$", "", tesla_stock$Open)
tesla_stock$High <- gsub("\\$", "", tesla_stock$High)
tesla_stock$Low <- gsub("\\$", "", tesla_stock$Low)
tesla_stock$Close <- tesla_stock$Close.Last
tesla_stock$Close.Last <- NULL
```

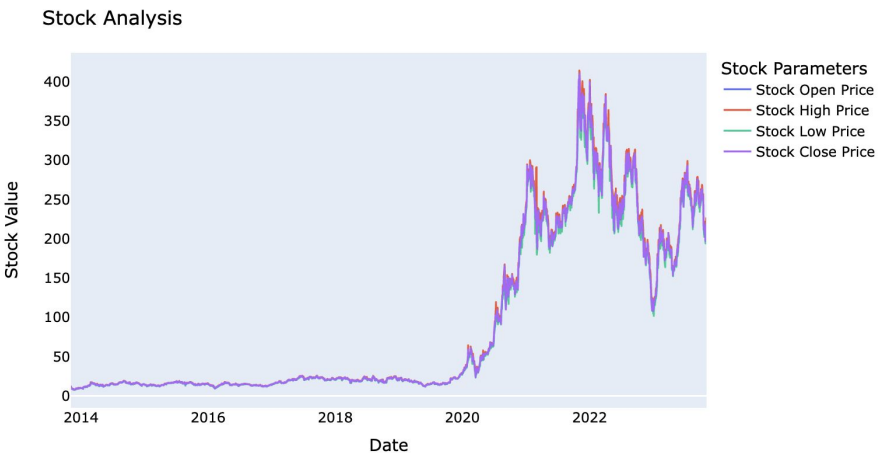
```r
# Remove the $ in the dataset
lucid_stock$Close.Last <- gsub("\\$", "", lucid_stock$Close.Last)
lucid_stock$Open <- gsub("\\$", "", lucid_stock$Open)
lucid_stock$High <- gsub("\\$", "", lucid_stock$High)
lucid_stock$Low <- gsub("\\$", "", lucid_stock$Low)
lucid_stock$Close <- lucid_stock$Close.Last
lucid_stock$Close.Last <- NULL
```

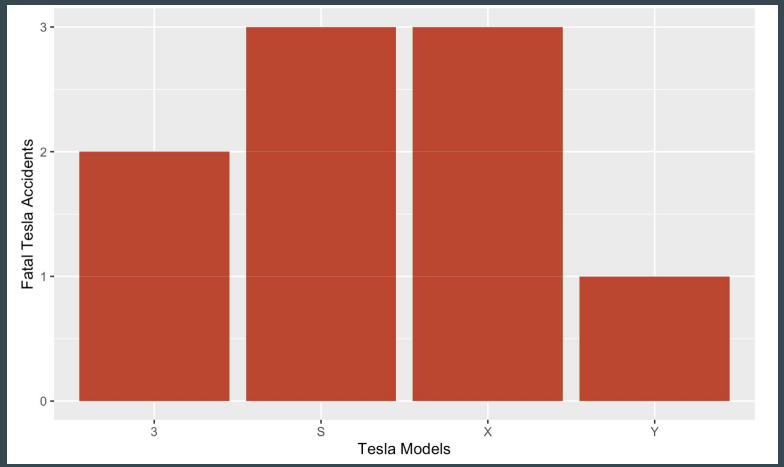
Combining our datasets

Exploratory Analysis









Tesla Visualization

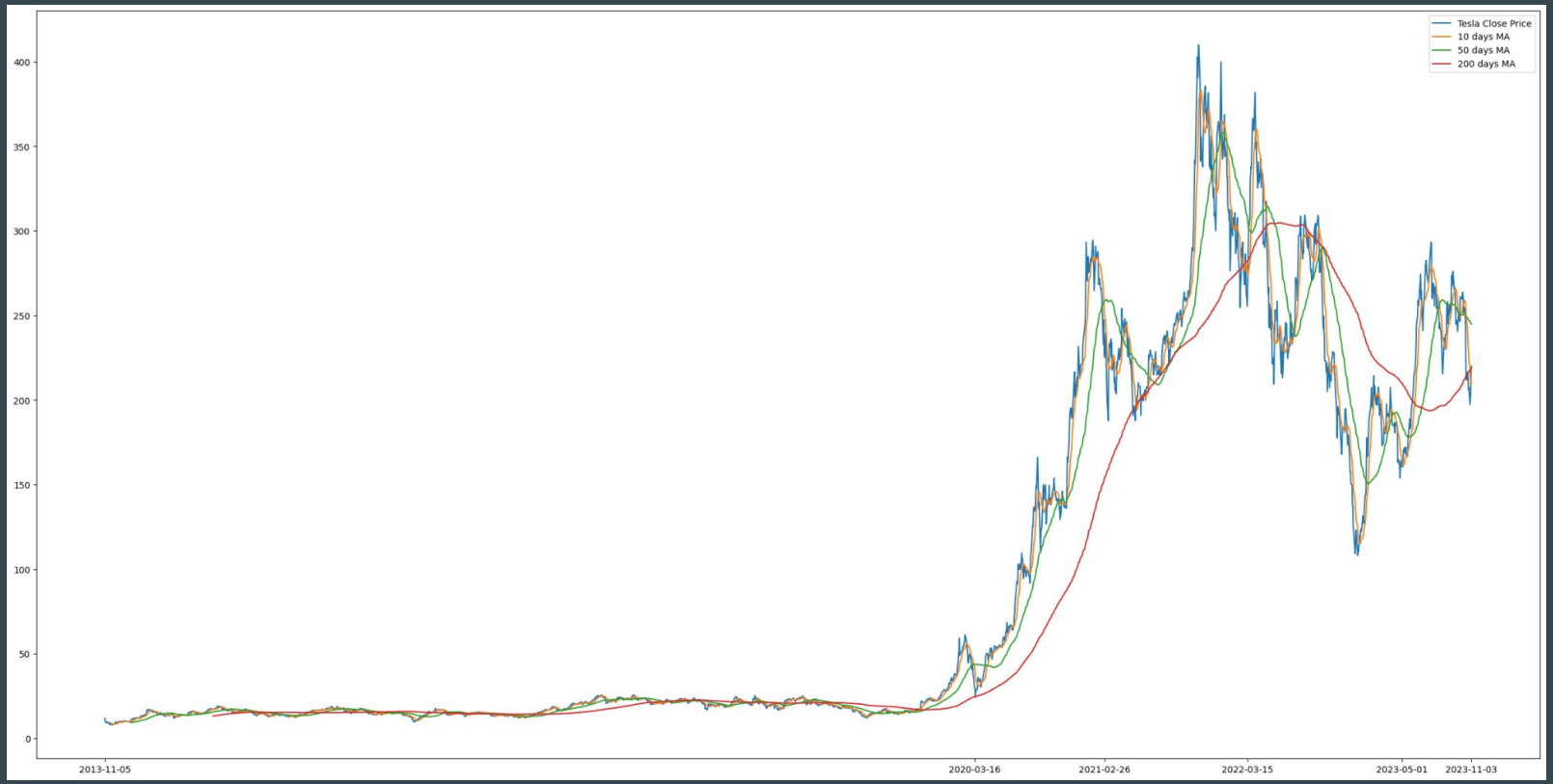
Deadly accident days highlighted

Why the increase in deaths?

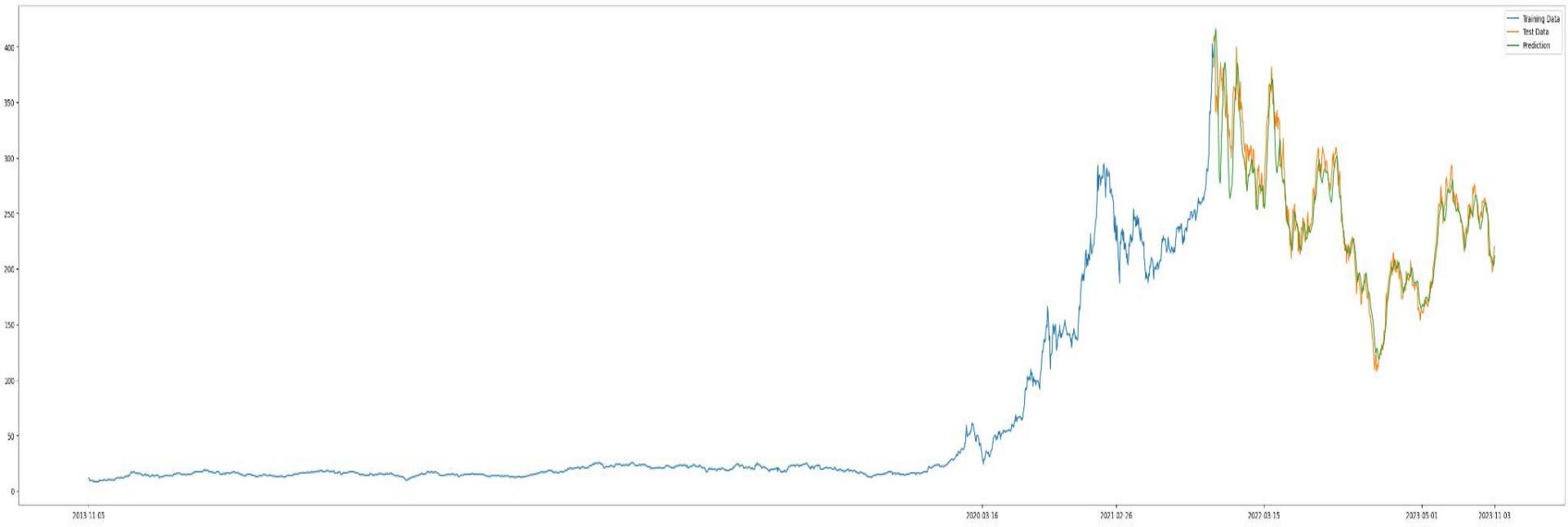
- More teslas being bought = more people driving them = more opportunities for accidents to happen

Tesla Rolling Mean Average

A rolling average continuously updates the average of a data set to include all the data in the set until that point



Tesla Model Simulation

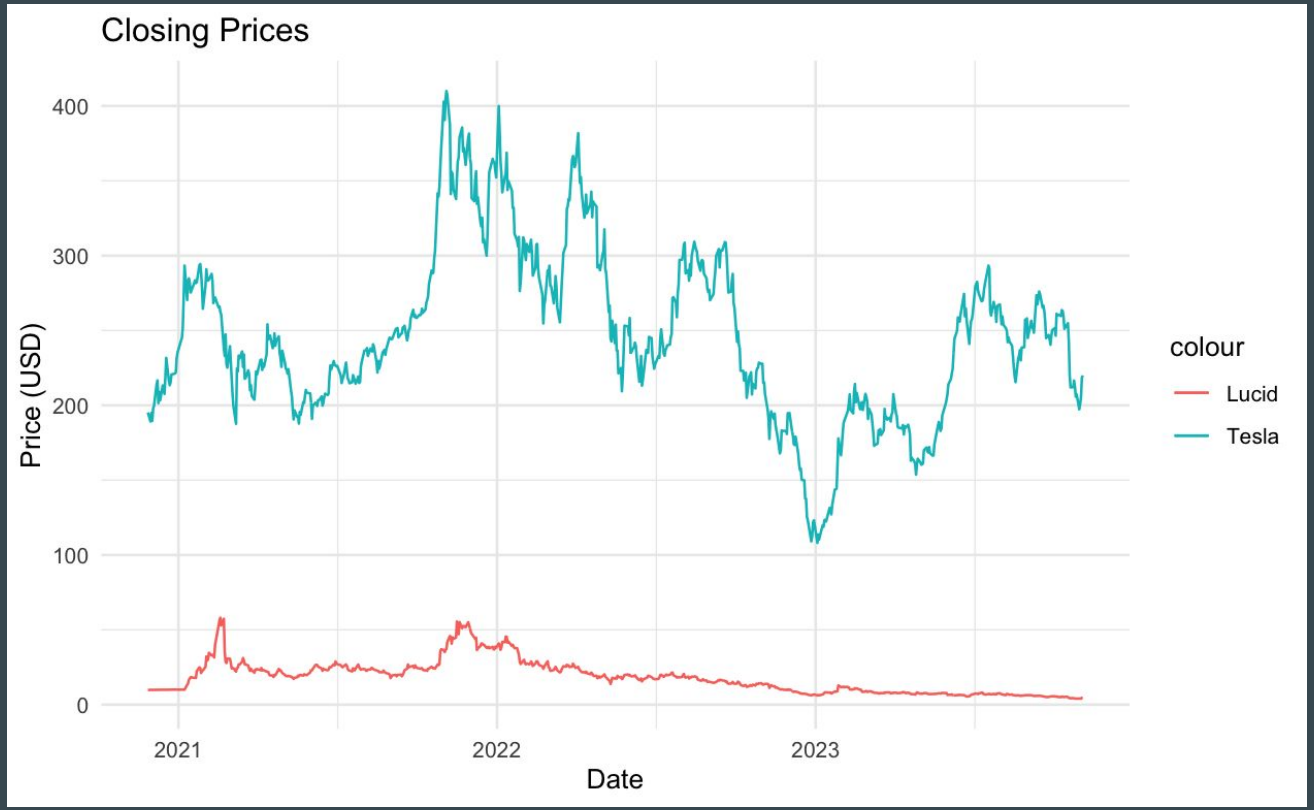


Cont.


Training Data
Test Data
Prediction
2022-03-15
2023-05-01
2023-11-03

Lucid Visualization

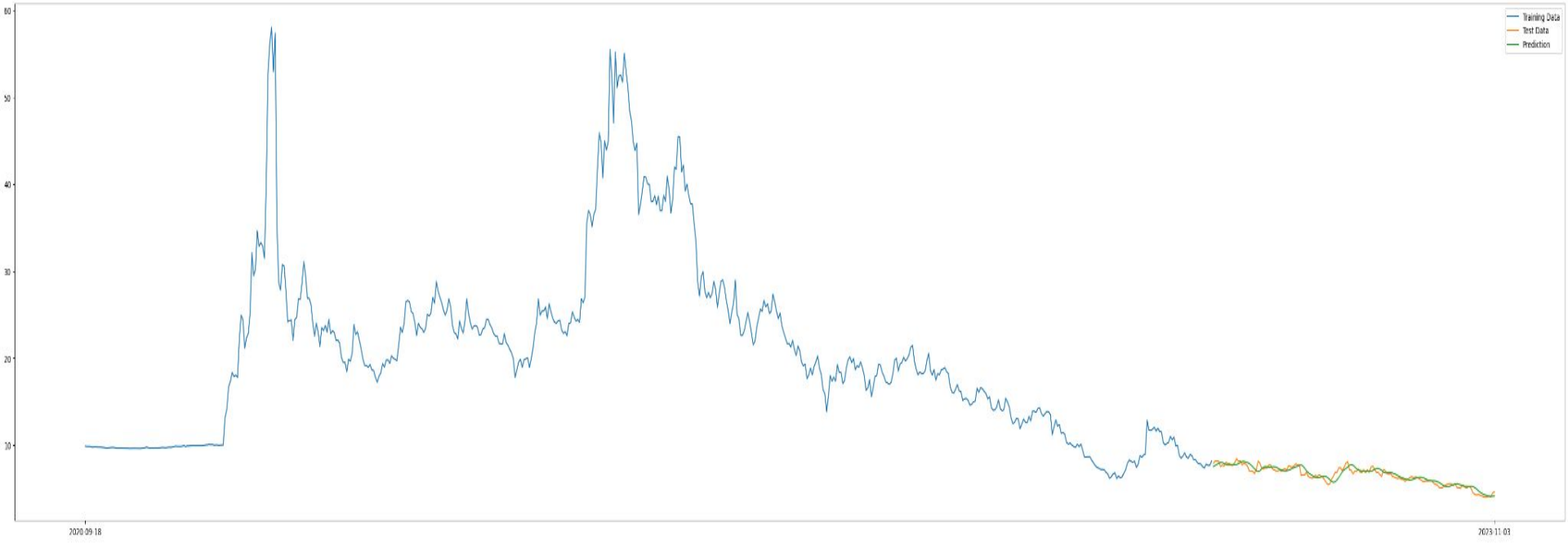
Stock Close Visualization Side by Side



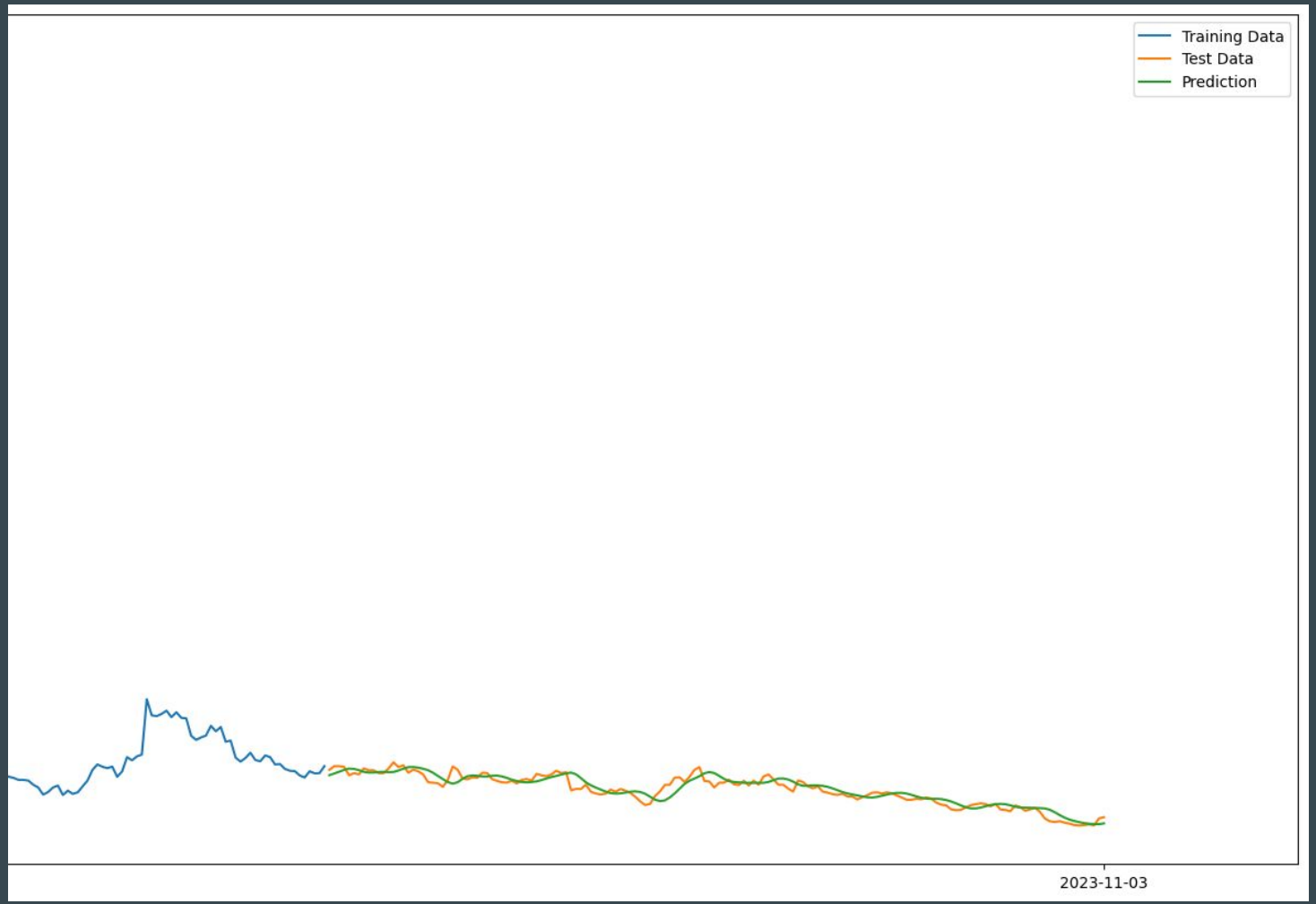
Lucid Rolling Mean Average

A rolling average continuously updates the average of a data set to include all the data in the set until that point

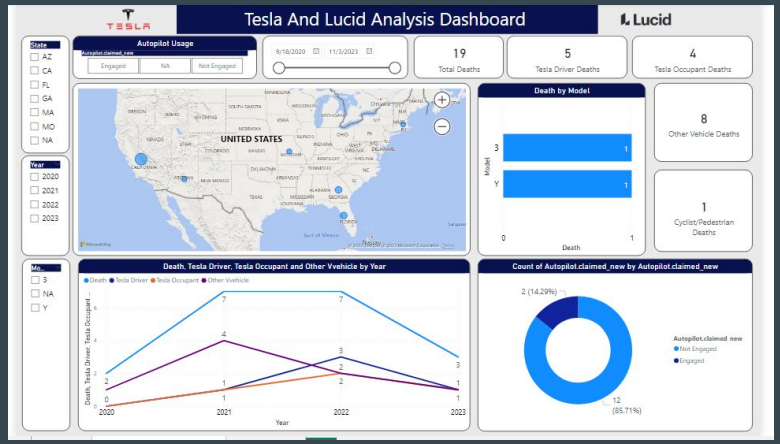
Lucid Model Simulation

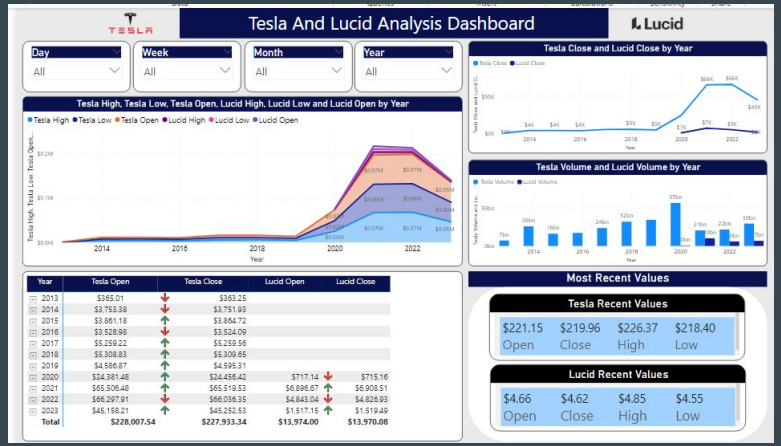


Cont.



Dashboard


Tesla And Lucid Analysis Dashboard
Lucid
Autopilot Usage
19
Total Deaths
5
Tesla Driver Deaths
4
Tesla Occupant Deaths
UNITED STATES
Death by Model
8
Other Vehicle Deaths
1
Cyclist/Pedestrian Deaths
Death, Tesla Driver, Tesla Occupant and Other Vehicle by Year
Count of Autopilot.claimed_new by Autopilot.claimed_new


Tesla And Lucid Analysis Dashboard
Lucid
Day
Week
Month
Year
Tesla Close and Lucid Close by Year
Tesla High, Tesla Low, Tesla Open, Lucid High, Lucid Low and Lucid Open by Year
Tesla Volume and Lucid Volume by Year
Most Recent Values
Tesla Recent Values
$221.15 Open
$219.96 Close
$226.37 High
$218.40 Low
Lucid Recent Values
$4.66 Open
$4.62 Close
$4.85 High
$4.55 Low

Conclusion

We believed that if fatal car crashes were publicized in the news, it may impact the success of Tesla.

We hypothesized that there would be a relationship between fatal car crashes and stock price for Tesla, but we found that there may not be a strong relationship.

Discussion

Generally the automotive industry is cyclical in that its stock and therefore the industry's success is based on how well the economy is doing. Factors such as employment rate, inflation, retail sales, interest rates, and disposable income can impact stock price in the automotive industry. Because Tesla's business model is different from the rest of the automotive industry, there may be some factors that are not as important or valued especially since Tesla does not rely on dealerships to sell their cars and they develop many of their own parts

Next Steps and Future Analysis

- Compare safety of electric vehicles to all cars
- Does sustainability relate to vehicle safety?
- Consider new variables that could have a stronger relationship to stock price
- Do a linear regression to find which variables have a strong relationship to the stock price

Sources

Kaggle python code for simulations and rolling mean avg

Cite Carly for exploratory analysis code and replacing data with NAs

Site where we got our datasets

Background on tesla and lucid

https://www.investopedia.com/articles/active-trading/072115/what-makes-teslas-business-model-different.asp

https://blog.gitnux.com/companies/lucid-motors/

reminder-Put stuff on github

https://www.tesladeaths.com/

Bachman, Elon, and I Capulet. “Digital Record of Tesla Crashes Resulting in Death.” *Tesla Deaths*, Tesla Deaths, 29 Sept. 2023, www.tesladeaths.com/.

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“TSLA Historical Data .” *Nasdaq*, www.nasdaq.com/market-activity/stocks/tsla/historical. Accessed 8 Nov. 2023.

https://www.nasdaq.com/market-activity/stocks/lcid/historical

“LCID Historical Data.” *Nasdaq*, www.nasdaq.com/market-activity/stocks/lcid/historical. Accessed 8 Nov. 2023.