

Capstone Project Presentation

Hal Tran

1. Introduction



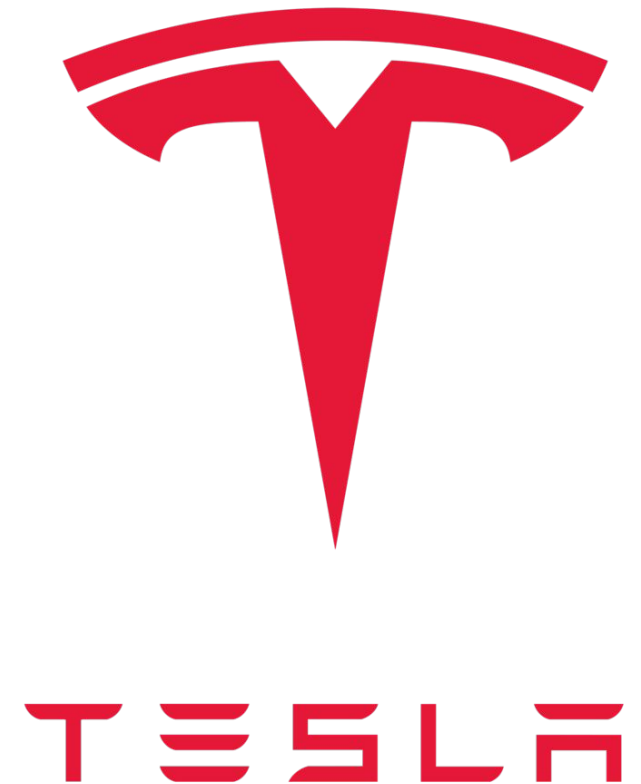
Topic Question

“As a company, what are the most major factors that affect Tesla's growth, from its stock and EV sales data?”

Tesla as a corporation has seen a massive rise to become one of the biggest companies currently active, which fascinates me as it seemingly happened before my eyes, in an industry of EVs as a thing I thought was far from becoming a viable form transportation just a few years ago.

I do this project as a way to further my understanding in both my fields of interest: data science and economics. What I thought was that there was not a better way to further my understandings than diving into a company I was yet familiar with, in an industry foreign to me, while analyzing stock data which I have never once before did.

Therefore, I wrote the question above to answer throughout this project, putting my best effort for further understandings and knowledge.

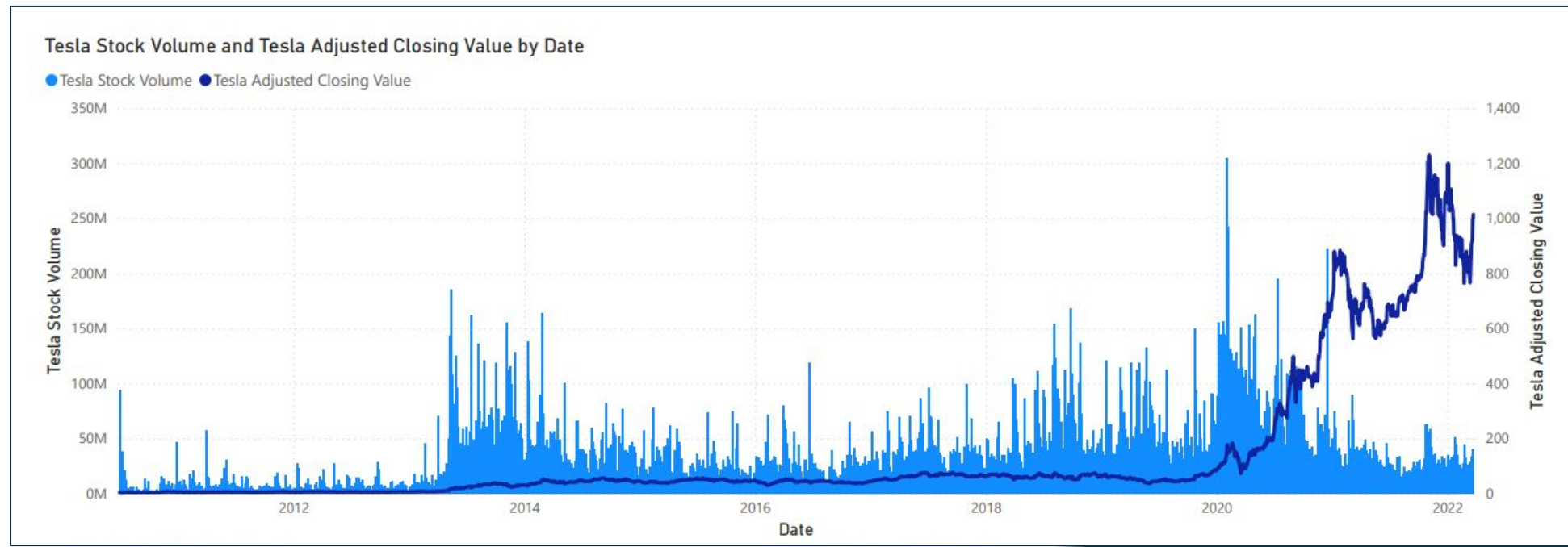


2. Tesla Stock Analysis



Tesla Stock Analysis

First, I analyzed the spreadsheet of Tesla stock 2010-2022 to gain insights of the general trends and patterns of the company's growth. After cleaning the data, I observed that the data allowed for an interactive candlestick graph and a trade volume graph within Jupyter. Later on when I use power BI, also made a graph combined of both trade volume and adjusted closing Price. I used these visualisations and observe their spikes and trends, to see what are the points of interest in this project.

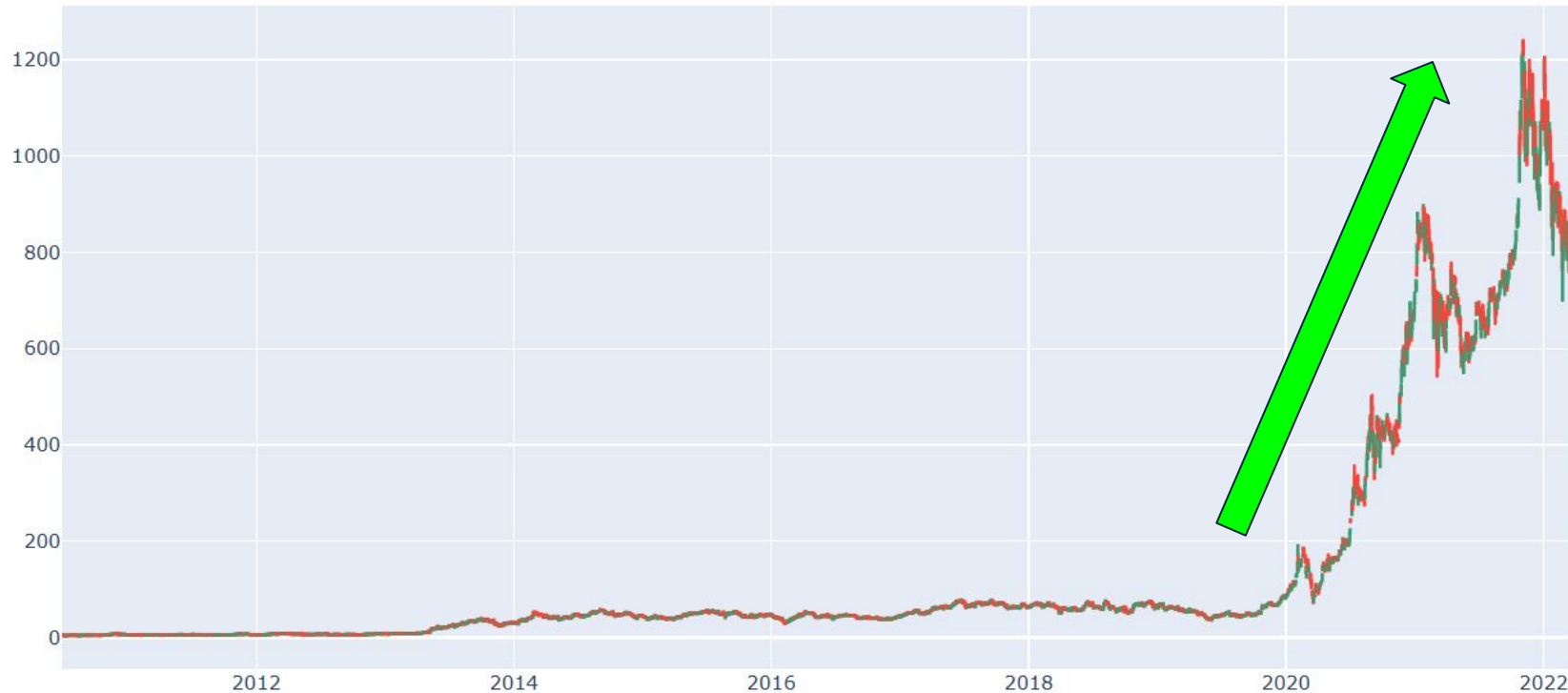


Tesla Stock Analysis

Tesla Candlestick Chart Over Time

```
#Candlestick chart for Tesla

fig = go.Figure(data=[go.Candlestick(x=tesla_df.index,
                                     open=tesla_df["Open"],
                                     high=tesla_df["High"],
                                     low=tesla_df["Low"],
                                     close=tesla_df["Close"])]])
fig.update_layout(width=1100, height=700, title_text= "Tesla Candlestick Chart Over Time")
fig.show()
```



The Tesla candlestick chart shows major spikes especially in and after the year 2020 and notably have high fluctuations. Most notable are the beginning of 2020, 2021 and 2022. However the rest of the graph remains difficult to see as those data points are overwhelmed by the heights of 2020 onwards.

Tesla Stock Analysis

Analyzing the candlestick pre 2020 gave a better view into the candlestick trends. Particularly the stock has strong increasing trends starting mid 2013 and another within 2017. There is a big temporary dip in 2016, and a consistent down trend beginning to mid 2019 before stock rises again later on.

```
tesla_df_filtered = tesla_df[tesla_df.index <= "2020-01-01"]
tesla_df_filtered
```

```
#candle stick chart that goes up until 2020
fig = go.Figure(data=[go.Candlestick(x=tesla_df_filtered.index,
    open=tesla_df_filtered["Open"],
    high=tesla_df_filtered["High"],
    low=tesla_df_filtered["Low"],
    close=tesla_df_filtered["Close"])]])
fig.update_layout(width=1100, height=700, title_text="Tesla Candlestick Chart Up Until 2020")
fig.show()
```

Tesla Candlestick Chart Up Until 2020



Arrows indicate direction of trends of interest, while red circle indicates local minimums of interest.

Tesla Stock Analysis

As increasing trends can be further explored using the EV dataset, the significant dips of Tesla will be addressed first in this section.

According to my research, in 2016, the initial dip early in the year was the result of Model X's production struggles from being under-supplied and investors being hesitant in Tesla's ability to uphold their 2016 goals.

But once the Model 3 got released, the resurgence of stock value is evident



Tesla is slashing its workforce by 7% to make a cheaper Model 3

Tesla Stock Analysis

2019 starts with Tesla laying off 7% of its workforce to lessen production budget of Model 3. Following that, the stock trends downward and lowered considerably.

According to Elon Musk, the CEO of Tesla, it was due to “production and logistics hell”. Tesla missed its production and delivery quotas most likely due to the nature of Model 3 being made for the mass market, becoming significantly more demanded by customers than other models and overwhelming the company supply chain. Other factors like its expansion of gigafactories and some previous Elon controversies may also have contributed to this downward trend.

However Tesla quickly recovers after its bottleneck is resolved and investors becomes more optimistic of its future prospects.



3. Tesla Ev Analysis



Tesla EV Analysis

The majority of this dataset was analyzed in Jupyter (aside from power BI), where I cleaned the dataset to be after 2009 up until 2023 model year for compatibility with the stock dataset. I then split the data into multiple variations to specify my analysis and visualization, focusing on Tesla. In analysis I've noticed that the graphs of this EV dataset, the growths both in sales and technology are more visible while temporary trends can be hardly seen. Therefore in this section I will focus on the upward trends of Tesla.

Note that this dataset's year are the model years of each vehicle, and that it is limited to EV registered by Washington State Department of Licensing.

```
years = EV_df["Model Year"]
i = EV_df[(years < 2009) | (years > 2023)].index
cleaned_df = EV_df.drop(i)
cleaned_df
```

```
#making a df with only data of Tesla make
non_tesla = cleaned_df[(cleaned_df["Make"] != "TESLA")].index
tesla_only_df = cleaned_df.copy()
tesla_only_df = tesla_only_df.drop(non_tesla)
tesla_only_df
```

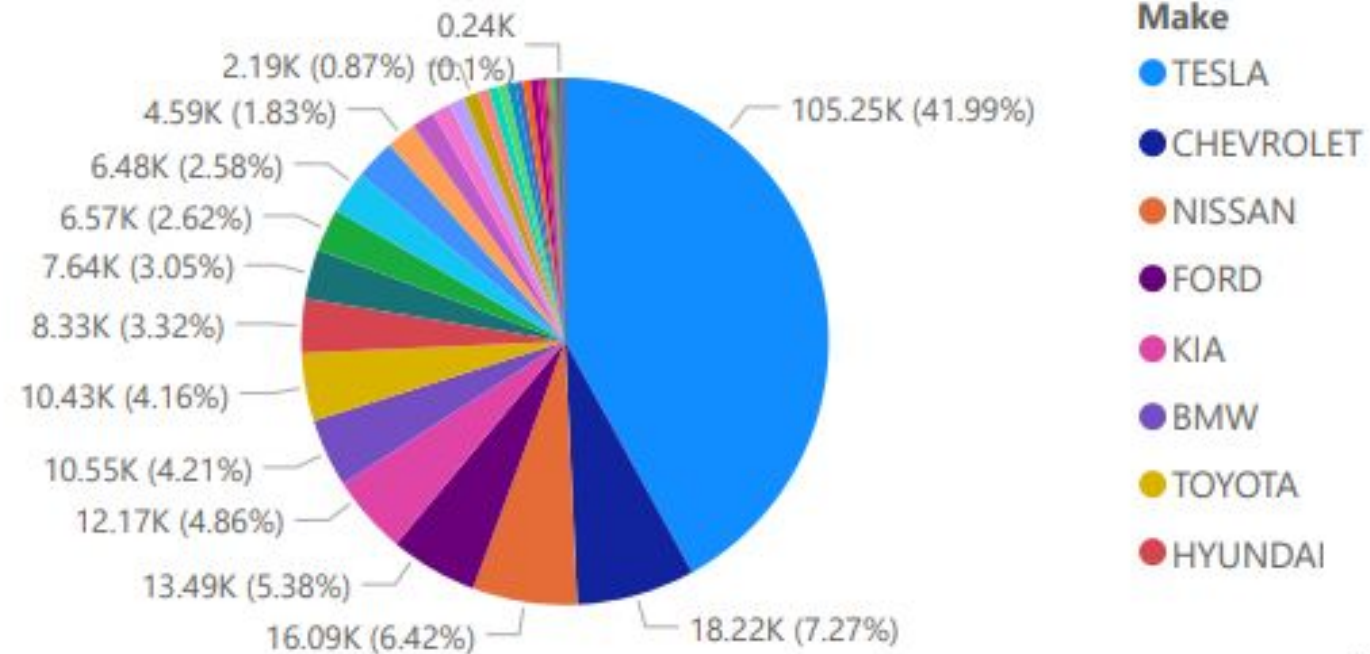
```
#making a dataframe with make of only "TESLA" or "OTHERS"
tesla_n_others_df = cleaned_df.copy()
tesla_n_others_df["Make"] = tesla_n_others_df["Make"].apply(lambda x: "TESLA" if x == "TESLA" else "OTHERS")
tesla_n_others_df
```

Tesla EV Analysis

From the one of the pie charts that I made in power BI, Tesla accounts to over 40% of all Electric Vehicles registered by Washington State Department of Licensing.

Furthermore, looking at the statistics Tesla compared to other EVs since 2010 to 2023 model year, we can observe Tesla slow rise in not only popularity but also consistent dominance over the EV market.

Proportions of EVs by Make



Above is a pie chart I made using Power BI

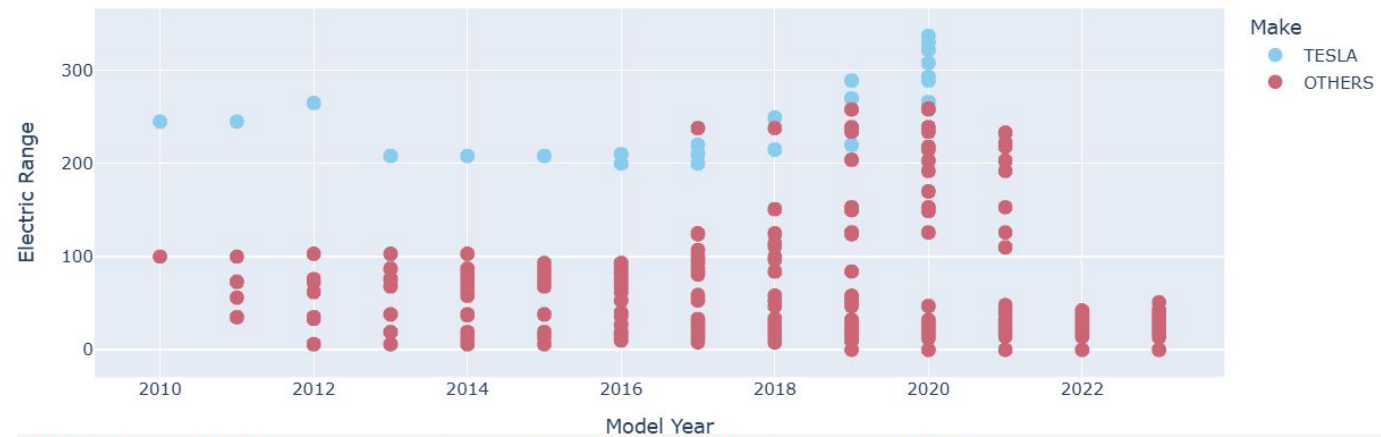
Tesla EV Analysis

As visible here on the scatter chart I made for comparison between Tesla and its competition, which has two variations to easily focus on Tesla or its competitors. We can see that for the majority of the years, especially in the first half, Tesla dominates over its competitor in electric range. Afterwards, the range decreases before rising again, which from my research is seemingly due to Tesla focusin on other factors like autopilot, better heating technologies, and designs.

However, the range and model variety picking up since 2016, which I will elaborate upon. Note that I lack data for Tesla Electric Range beyond 2020.

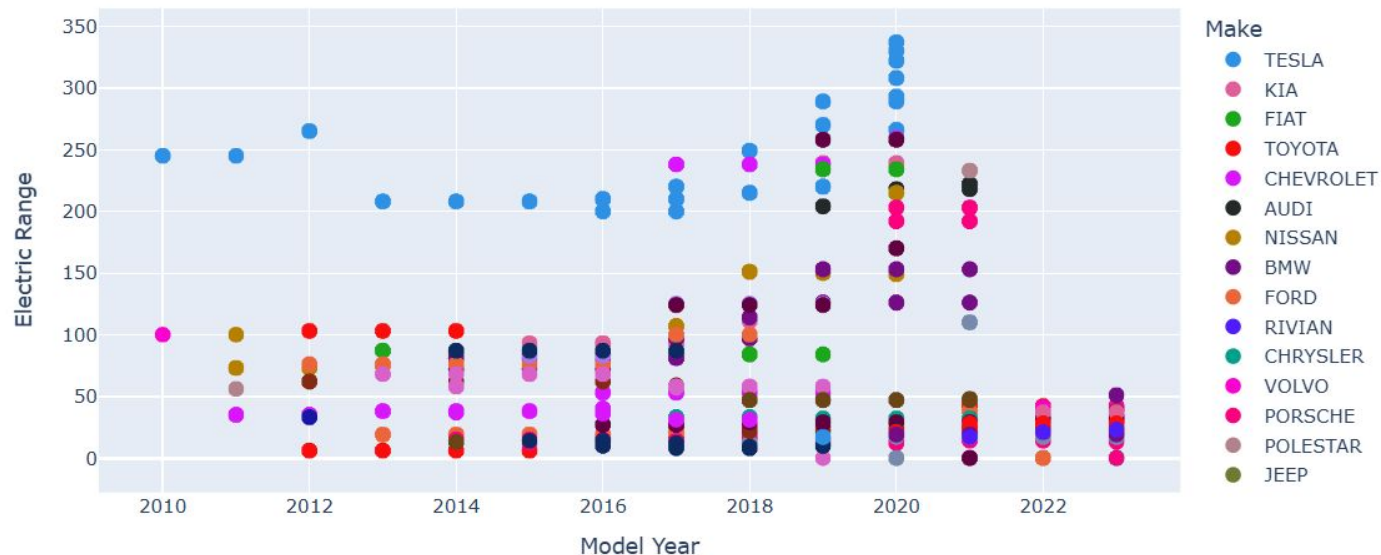
```
#Comparing Tesla electric range vs other makes. They outperform most competitions, and have more range variety since 2016
fig = px.scatter(tesla_n_others_df, y = "Electric Range", x="Model Year", color="Make", color_discrete_sequence=px.colors.qualitative.Safe)
fig.update_traces(marker_size=10)
fig.update_layout(scattermode="group",width=1000, height=400, title = "Tesla Models's Max Electric Range vs Others")
fig.show()
```

Tesla Models's Max Electric Range vs Others



```
#Looking at individual competitions to see who are some notable competitors to Tesla in electric range
fig = px.scatter(cleaned_df, y = "Electric Range", x="Model Year", color="Make", color_discrete_sequence=px.colors.qualitative.Dark24)
fig.update_traces(marker_size=10)
fig.update_layout(scattermode="group",width=1000, height=400, title = "Tesla Models's Max Electric Range vs Others")
fig.show()
```

Tesla Models's Max Electric Range vs Others



Tesla EV Analysis

The first major jump in Tesla's prevalence in the EV market occurs for the 2012 models, a sudden increase from 8 to 115 in Tesla vehicles being registered. Followed by another increase of nearly 500% the subsequent year. These increases can be explained by Tesla's release of Model S that was the first step in the lines of models to come, as planned by Tesla's "Master Plan".



Tesla EV Analysis

The Model S was the first of its kind for many innovations including being the first to include a lithium-ion battery with mileage that could rival non-electric vehicles. It is still considered one of the most important cars in modern history with numerous awards show how influential the Model S was in changing the EV landscape forever. It was one of the important first steps of Tesla's plan, to begin with a high end low volume car and expands from there.

Is the Tesla Model S the Most Important Car of the 21st Century?



BY BRETT BERK

AUGUST 6, 2012

Master Plan, Part Deux

Elon Musk, July 20, 2016

The first master plan that I wrote 10 years ago is now in the final stages complicated and basically consisted of:

1. Create a low volume car, which would necessarily be expensive

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Tesla Model S: the most important car of the last 20 years

Chris Knapman reveals seven reasons why the Tesla Model S is the greatest game changer in motoring for decades

[+ VERGE ARCHIVES](#)

Tesla Model S named Motor Trend Car of the Year by unanimous decision

Tesla EV Analysis

At the tail end of 2015, the Model X would be released and once again, a noticeable increase occurs. Roughly two back-to-back 60% increase in EVs saw the number of EVs in Washington go from around 600 newly registered in one year to nearly triple that with over 1500 newly registered in one year.

Distribution of Tesla EV vs Other Brands



Tesla EV Analysis

The release of the Model 3 in 2017 saw Tesla dominate over the EV market as this car became the best-selling EV vehicle from the years 2018-2020. From this graph, a massive jump of 368% as Tesla's sales can be compared to the combined sales all other brands' registered EVs.

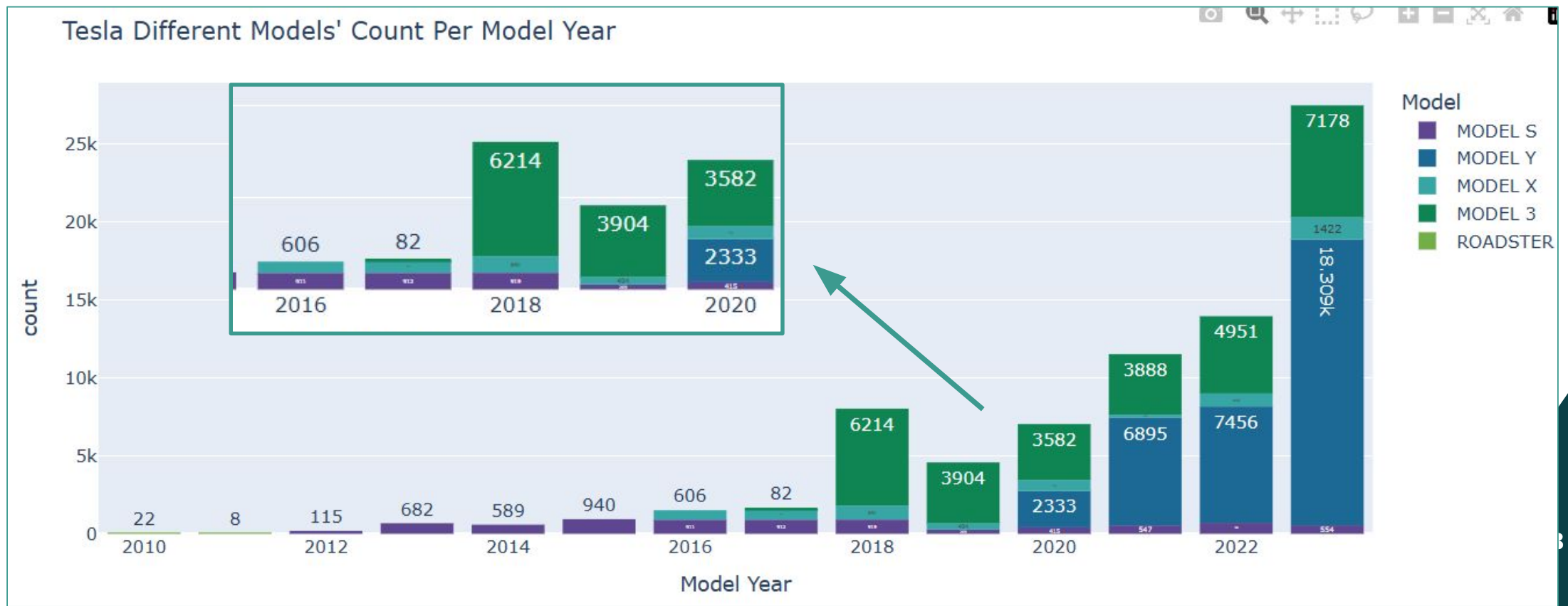
Distribution of Tesla EV vs Other Brands



Tesla EV Analysis

From this graph the Model 3 accounted for $\frac{3}{4}$ of all Tesla Models for 2018. Additionally, before this no other Tesla model have yet to surpass 1000 units sold in a year until Model 3 smashes that as one of the last of Elon Musk's "Master Plan": to make a cheaper car of high volume that appeals to the majority. The temporary low in 2019 can be explained by Tesla's production and delivery issues I've talked about at length in the section about its 2019 stock trends.

```
plot = px.histogram(tesla_only_df, x = "Model Year", color = "Model", text_auto=True, color_discrete_sequence=px.colors.qualitative.Prism)
plot.update_layout(bargap=0.2,width=1100, height=450, title = "Tesla Different Models' Count Per Model Year")
plot.show()
```



Tesla EV Analysis

Model 3 was designed for the majority, with prices hovering around ~\$35,000 to appeal to a wider demographics. Even with this price, Tesla maintained the model at high quality and superior technology and innovation compared to most competitors, as Tesla expands its productions and factories larger than ever before.

As a review puts it, “The Model 3 proves that Tesla is thinking far beyond... Model S and X... were always meant as intermediaries, stepping stones designed to draw people away from comfortable convention and into the future of the automobile.”, further demonstrating the advancements Tesla vehicles lead and showing Tesla’s business strategy at work.

Tesla sells 3 million Model 3 since 2017, one in every 1.5 minutes

This translates to one Model 3 being sold every 1.5 minutes on average for the past eight years.



Published 1 month ago on July 21, 2025

By Simon Alvarez X

2018 Design of the Year: Tesla Model 3

A vanguard for electric vehicle design and styling

Barry J. Holmes - Photographer; Robert Cumberford - Writer | Jan 17, 2018

Master Plan, Part Deux

Elon Musk, July 20, 2016

The first master plan that I wrote 10 years ago is now in the final stage complicated and basically consisted of:

1. Create a low volume car, which would necessarily be expensive
2. Use that money to develop a medium volume car at a lower price
3. Use *that* money to create an affordable, high volume car

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Car of the Year: Tesla Model 3



SUCCESS

Tesla's Model 3 was the best-selling luxury car of 2018

Published Tue, Jan 8 2019 3:28 PM EST • Updated Thu, Jan 10 2019 9:08 AM EST



Tom Huddleston Jr.

SHARE f X in

Tesla EV Analysis

From 2020 onwards there exists steady growth on vehicle sales, which can be explained by generally optimistic outlooks for Tesla as it continues to expand on all fronts: vehicle productions, factories, development in technologies and softwares including AI and autopilot, along with its energy businesses. Model Y was based on Model 3 and improved upon users' comfort. From my research, 2023 models' sudden increase is more reflective of the public's optimism than specific breakthroughs.

Tesla Different Models' Count Per Model Year



4. Insights & Conclusion



Insights & Conclusion

Topic Question: *“As a company, what are the most major factors that affect Tesla's growth, from its stock and EV sales data?”*

First, Tesla itself is quite proactive in its growth, seeing how it is the industry leading brand in terms of EVs. The head of the company, Elon Musk, stated his “Master Plan” quite clearly which makes it easier to track the company’s development. We can notice that stock and vehicle sales often rises when a new vehicle model release, as Tesla takes significant time and resources so that it could to make newer models as much of an improvement and innovation to the field as it could. This new tech brings hype and public interests into Tesla as they are not only the pioneers but creators of this new technology. So if one’s interest is within tracking the next spike of Tesla stock or sales, I’d say look no further than the releases of Tesla’s models.

Tesla constantly expands itself in different areas that serve its vehicles: hardware and software technology for its EVs, factory production, and energy. While this is splendid for Tesla’s growth, it does sometimes lead to certain failed expectations in productions and logistic which can affect the stock greatly and make it volatile especially in the short term before and after the releases of each model.

Insights & Conclusion

Topic Question: *“As a company, what are the most major factors that affect Tesla's growth, from its stock and EV sales data?”*

One point I've yet to mention to keep the slides flow naturally, is that the stock is a better reflector of people's current outlook for Tesla, which is why it is such a volatile stock: people often overestimate or underestimate the value of Tesla, almost constantly due to the push and pull of its innovations and expansions. This is reflected well in the stock, but perhaps not as well in the EV sales: the short intervals of optimism and pessimism means that the sales increases when the market is optimistic, but once the buyer's decisions are made it is difficult to unown the vehicle, at least before the next wave of optimism. This explains the consistent model year's sales in the EV dataset despite the drastic changes in the stock dataset.

The End!

Thank you for spending your time reading/watching my presentation.

I've learned a lot from working on this project! It was fun having to research and dive into the different fields that was foreign to me, and coming out of it with better knowledge of analysis regarding to economics, the field of EVs, and the company of Tesla! It is exciting to see more possibility opened for future projects, while having fun expanding upon my personal interests.

I hope you all have a very good day,

Hal Tran.



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Thank you

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