ELECTRIFYING INSIGHTS:

VISUALIZING TESLA'S PERFORMANCE

Tesla | Tableau Public

https://public.tableau.com/app/profile/yayuan.zhang/viz/Tesla_16825356489840/TeslaStory?publish=yes

ISM 6361 Data Visualization

APRIL 26, 2023

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Contents

1. Background

1.1 Business problem

The reason for selecting Tableau to solve my business problem is that it is a powerful data visualization tool that allows us to create interactive and visually appealing dashboards easily. I can quickly construct charts, graphs, and maps with Tableau to help comprehend and convey data more interestingly. Additionally, Tableau offers built-in data cleansing and blending tools that simplify combining numerous data sources into a single display. This is helpful for the commercial issue mentioned above, where I need to aggregate data from many sources. Furthermore, Tableau has a sizable online community where users may exchange visualizations, get feedback, and pick the brains of others.

1.2 Motivation

This project aims to explore Tesla's performance by visualizing its historical data. I chose this topic because our family recently purchased a Tesla Model Y, and we found the online data regarding the Tesla company was quite scattered. Therefore, the motivation behind this project is to understand whether Tesla is a profitable company to invest in and to create user-friendly dashboards for those interested in purchasing a Tesla car. As Tesla's online data is scattered, this project aims to provide a comprehensive and visual representation of its performance.

1.3 Stakeholders

Investors and those interested in pursuing Tesla stocks: They are willing to be interested in the compiled and reliable information presented in the dashboards. The dashboards will showcase distinctive key performance indicators to assist them in making more informed investment decisions.

Tesla's potential customers**:** They would research the model online before purchasing it. The dashboards offer them the data they might be looking for, which is pertinent to their decision-making.

Data analyst: They will be interested in the information from this dataset and dashboards that can help better explore Tesla trends. It also allows us to do some predictive projects via machine learning techniques.

1.4 Data & Source

Since the concept of electric cars has only emerged in recent years, and there is no existing dataset available for use in this project. Therefore, the dataset I collected for this project covers 2014 to 2022 and combines multiple data sources, including online databases and official reports. It includes quarterly sales figures, net profits, stock price changes, vehicle sales volume, market share, and the distribution of electric vehicle charging stations in the United States. After manual collection and basic data cleaning, I imported them into Tableau. The following is a detailed data sources introduction.

Production and deliveries of different vehicle models each year

This data comes from Tesla's quarterly reports and the Statista.com website.

[Tesla's official website], [Statista.com]

[https://ir.tesla.com/#quarterly-disclosure]

Statista [https://www.statista.com/statistics/502208/tesla-quarterly-vehicle-deliveries/]

Yearly sales and net income attributable to common shareholders and non-controlling interests

This data comes from Tesla's quarterly reports.

The Stock Price

This data was extracted using the Google Finance function from the online database of Google Finance. The function used was [=GOOGLEFINANCE("TSLA," "all," "1/1/2014", "4/19/2023", "DAILY")]. The data included the open, close, etc., daily stock price from 1/1/2014 to 4/19/2023.

The top 5 E.V.s of market share in US

This data comes from the Counterpoint Global Passenger Electric Vehicle Model Market Sales Tracker and the InsideEVs report. [https://report.counterpointresearch.com/posts/report_view/AutomotiveFutures/3720] [InsideEVs.com]

## The location and information of the electric vehicle charging station in the United States

This data comes from the records of the U.S. Department of Energy. This data includes the location, number of charging ports, whether it is free, and other relevant information about the charging stations. The information was updated in April 2023. The data also includes the year of opening for each charging station.

2. Tableau Dashboards

In my Tableau, I created four dashboards and seven charts in total. Next, I will introduce each dashboard and show how various features of Tableau work in my project.

2.1 Dashboard 1: Market Situation
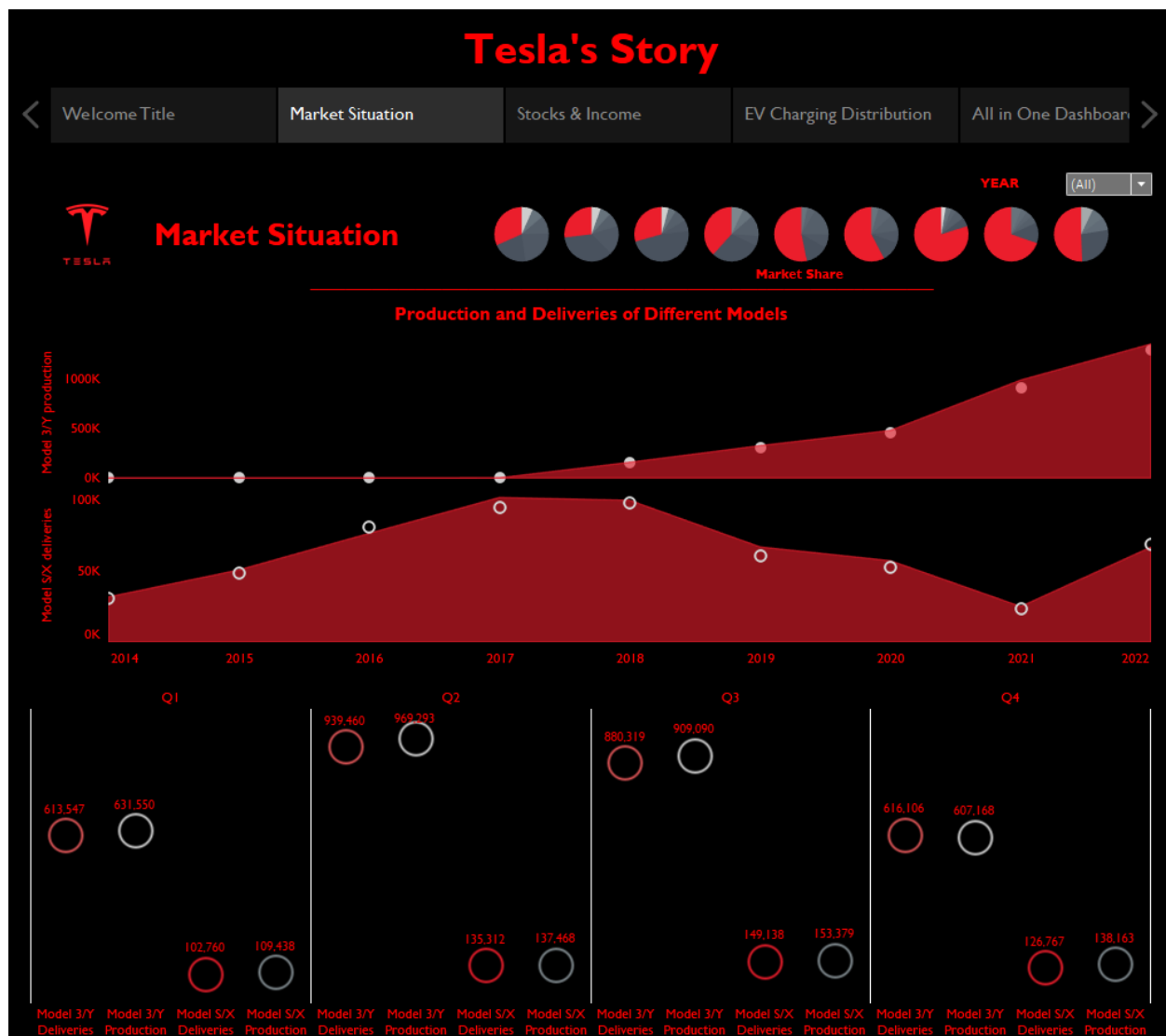
This dashboard has three charts, including the pie charts of market share, an area chart of annual production and deliveries of different models, and a circle chart of their detailed data for each quarter.

Pie charts of market share

Demonstrating Tesla's market share value can let the stakeholders understand the company's values and investment prospects. This chart can better present the changing trend of the market.

Get insight: The chart shows that in 2018, the company held a market share of over 50%, which increased to over 75% in 2020. Although the company's market share has declined slightly in the last two years, it is still the leader in the industry. This could be because other competitors have entered the market and offered a range of E.V. types.

Annual production and deliveries of different models and circle chart of their detailed data for each quarter

Showing the number of cars sold each quarter and year can help stakeholders understand the company's sales trends and production abilities. This chart is better for presenting sales trends and production abilities more intuitively.

Calculation feature: Count IDs to get the total amount.

Other: Set different colors and representation graphics to distinguish types.

Dashboard feature(s)

Filter: Year. The year filter in the upper right corner can obtain the data on specific years, like showing the production and delivery volume of specific vehicle models in a specific year, the data of different quarters in that year, and Tesla's market share in that year.

## 2.2 Dashboard 2: Stocks and Net income
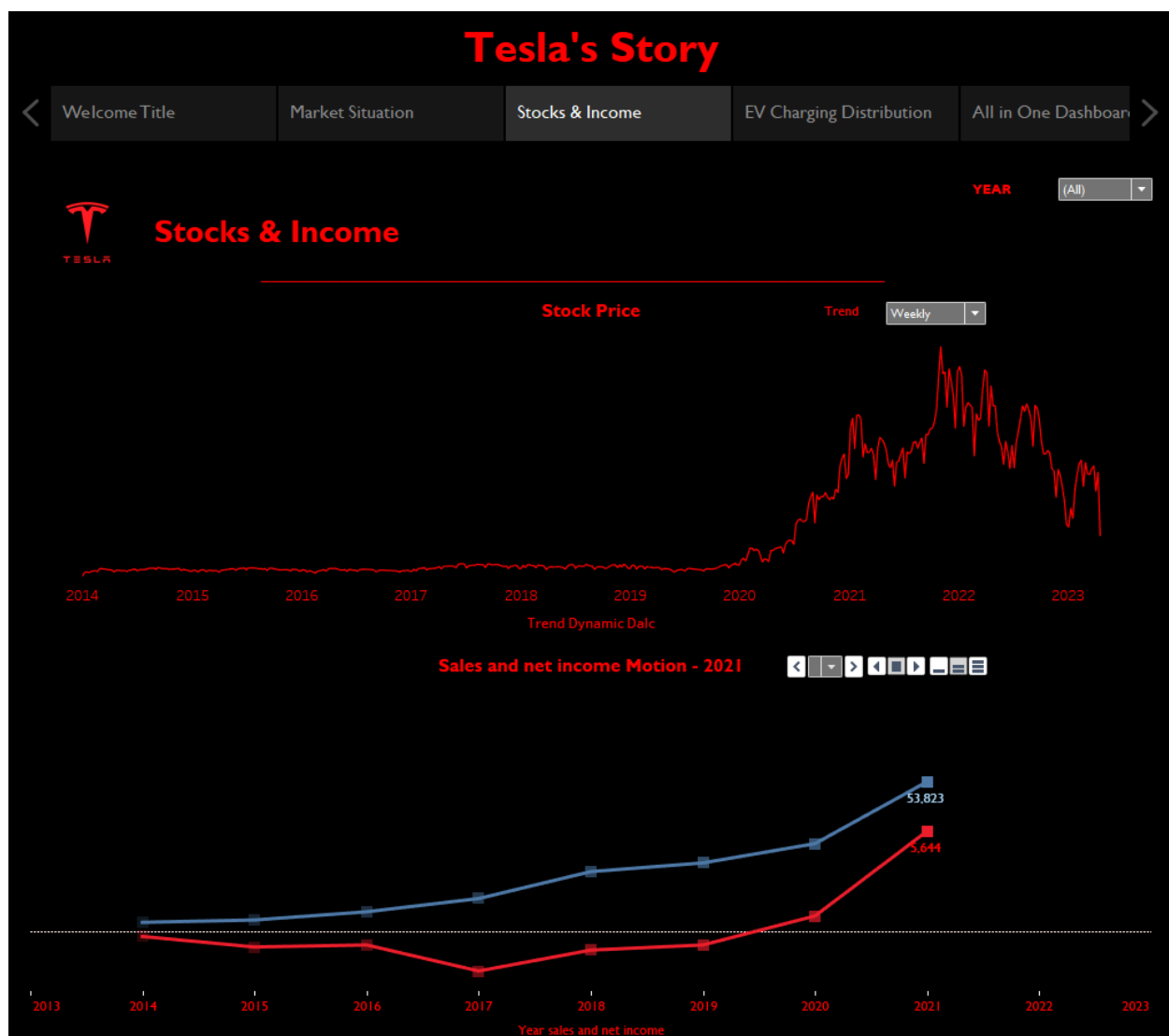
This dashboard has two charts: a line chart of stock price (close) and a motion line chart of revenue and net income.

Line chart of stock price (close)

Stock changes over the years are one of the important pieces of information, especially if the audience includes stock investors. Changes in stock prices can reflect investors' expectations and confidence in the company's future performance, so understanding the changing trend of stock prices is very helpful for analyzing the company's performance and development trends. This graph can help stakeholders better understand how the company is performing.

Trend parameter: To enable users to filter and view specific time ranges of stock price trends in Tableau, I created a new parameter and calculated a field. This allowed users to select from a drop-down list to view trends at various intervals, including yearly, quarterly, monthly, weekly, and daily.
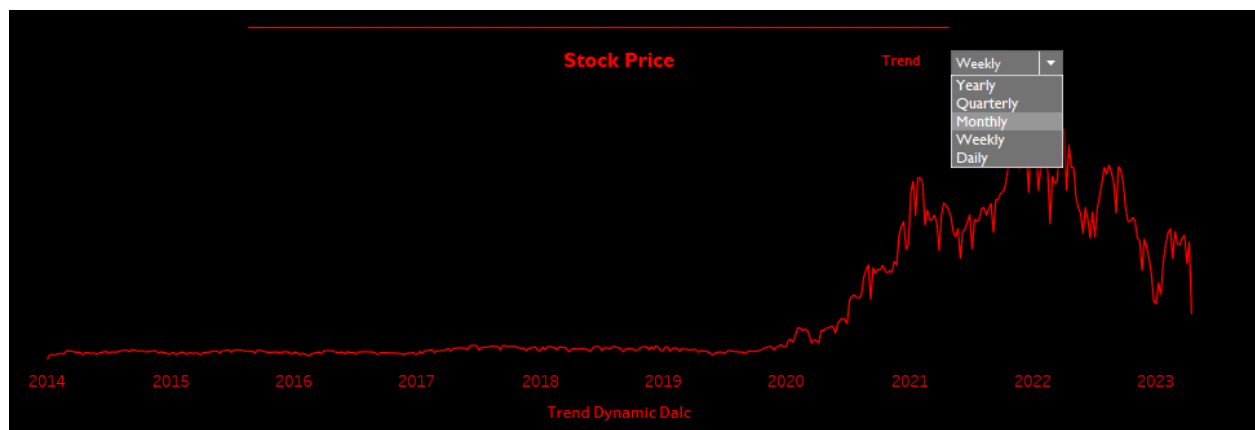
## Motion line chart of revenues and net income ($ in millions)

By showing net income and revenues (sales), and net income, the stakeholders can understand the company's profitability and financial stability. This chart can better present the changing trend of net income.

Analysis: The chart indicates that the net income in 2017 was the lowest year up to that point. This may be attributed to a large investment in advertising or other factors related to marketing decisions in that year. However, Tesla's net income started to rise steadily after 2017. The chart also shows that the company is profitable and has been rising steadily recently.

Animation: I added a new sheet to create a motion line chart to show the changes in revenue(sales) and net income from 2014 to 2022 by using the animation feature. Also, set to display historical data points in the chart.

Animation Control Parameter: Set data type as integer and set range of values from 2014 to 2022.

Dashboard feature(s)
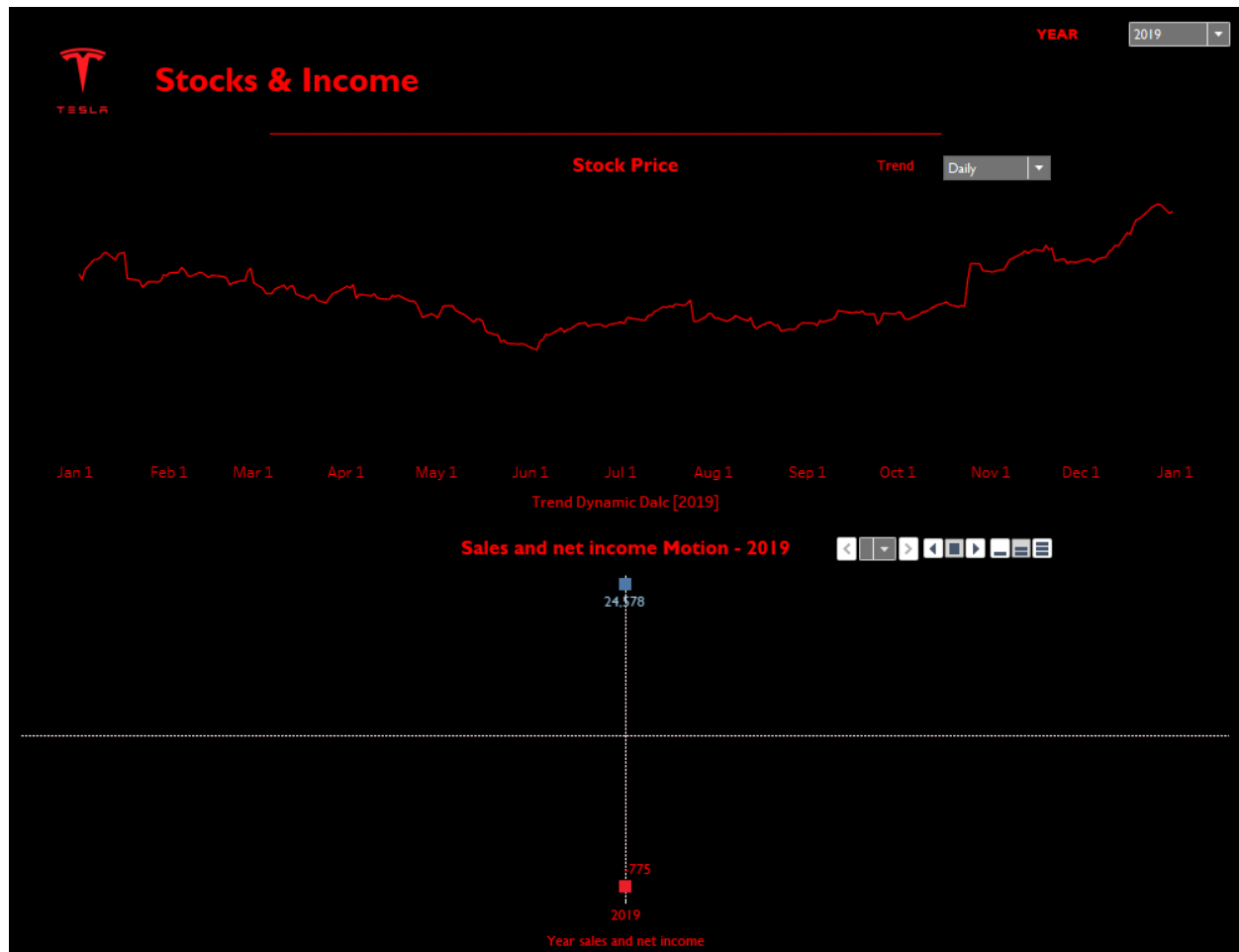
Composite Filter: Year.

The year filter in the upper right corner can obtain the data on specific years from the two charts. The good thing is that this filter can be used together with the trend filter of stock price. As shown in the screenshot above, I have access to the daily stock price fluctuations for 2019 and the income and net income data for that same year.

2.3 Dashboard 3: Distribution of Electric Vehicle Charging Stations in the U.S.
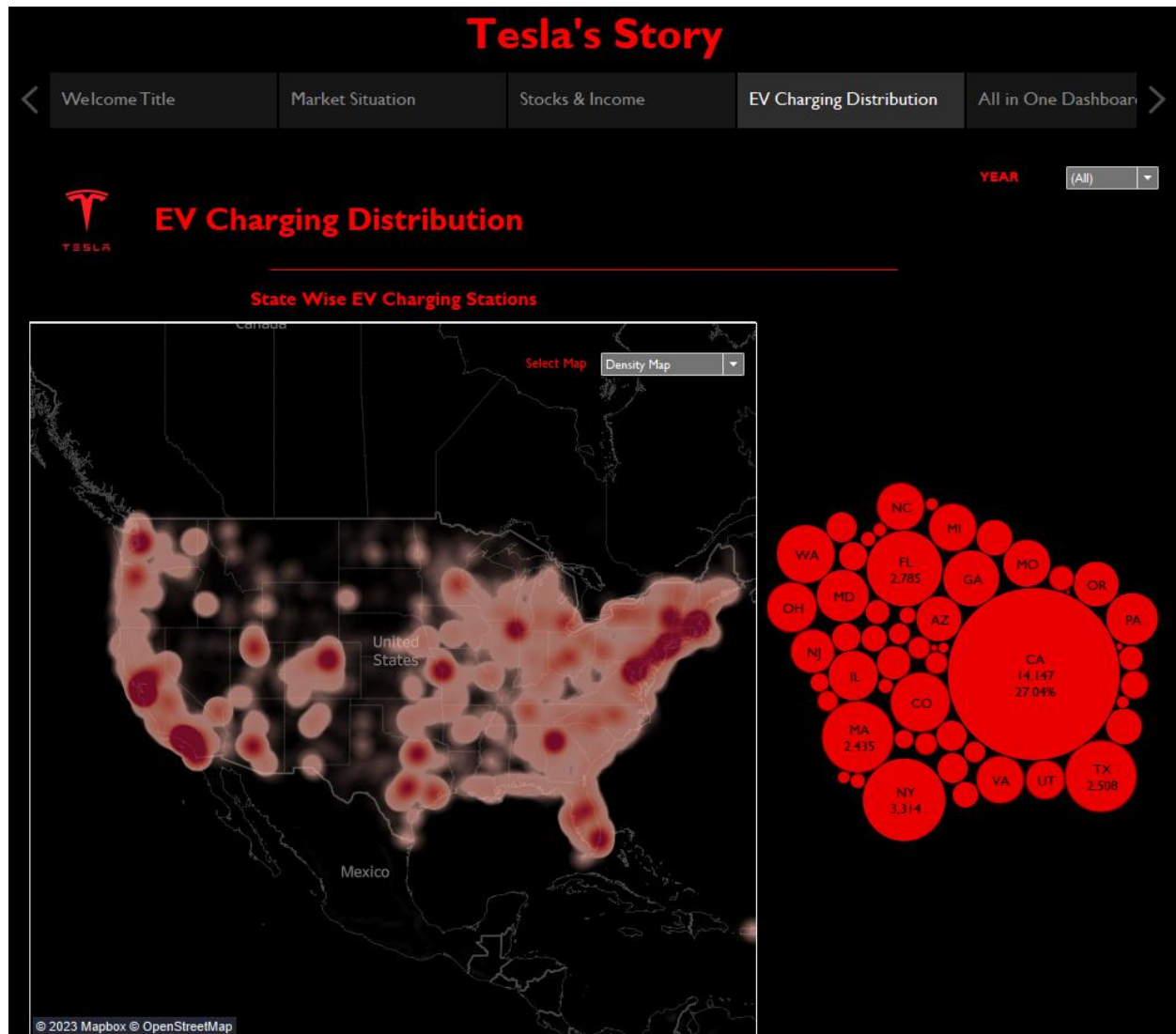
This dashboard has four charts, including the density map, distribution map, filled map, and bubble map of the distribution of electric vehicle charging stations by state.

Three charging station's location maps
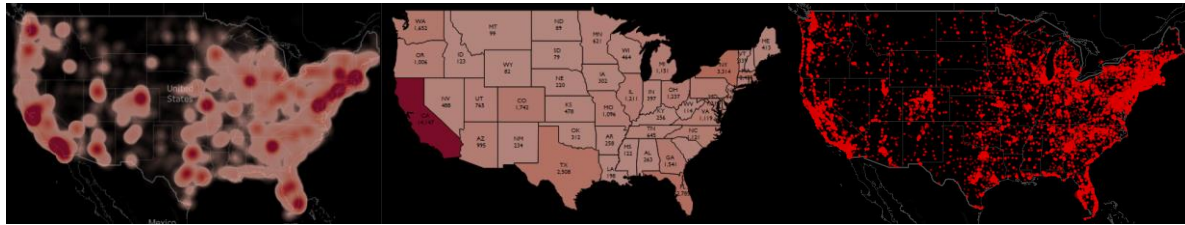
The number and distribution of Tesla charging stations can help stakeholders understand Tesla's efforts in promoting electric vehicles. To present this information comprehensively, three maps show the distribution of charging stations in different states in the USA.

Analysis: My analysis reveals that California, Texas, Florida, and New York have the highest number of EV charging stations and are the most common. By using the interactive features of our dashboard, we can identify specific areas with a high concentration of EV charging stations and potential opportunities for expansion. The three charts show that electric vehicle charging stations are concentrated on the east and west coasts, with most central regions concentrated around major cities near Chicago and Denver. Fewer charging stations are available in the inland Midwest of the United States. This distribution may be related to the economic prosperity of each state.

Select Map Parameter: Set data type as a string and allowable values as a list to display three maps.

Select Map Filter:

I used the following steps to create this interactive dashboard with a map filter feature. It allows users to view different maps based on their selected filter criteria.

1.   Add the <mark>Select Map Parameter</mark> to the Filters area of the three map sheets.

2.   Set the filter values to correspond to the maps.

3.   Add three maps to the dashboard in the same area.

4.   Hide the duplicate title.

5.   Set up a drop-down box button to select different maps on the dashboard to view if it works.

Bubble map

Calculation: Count ID to get the number of stations open by state. It also shows the percentage of charging stations in the state.

Dashboard feature(s)
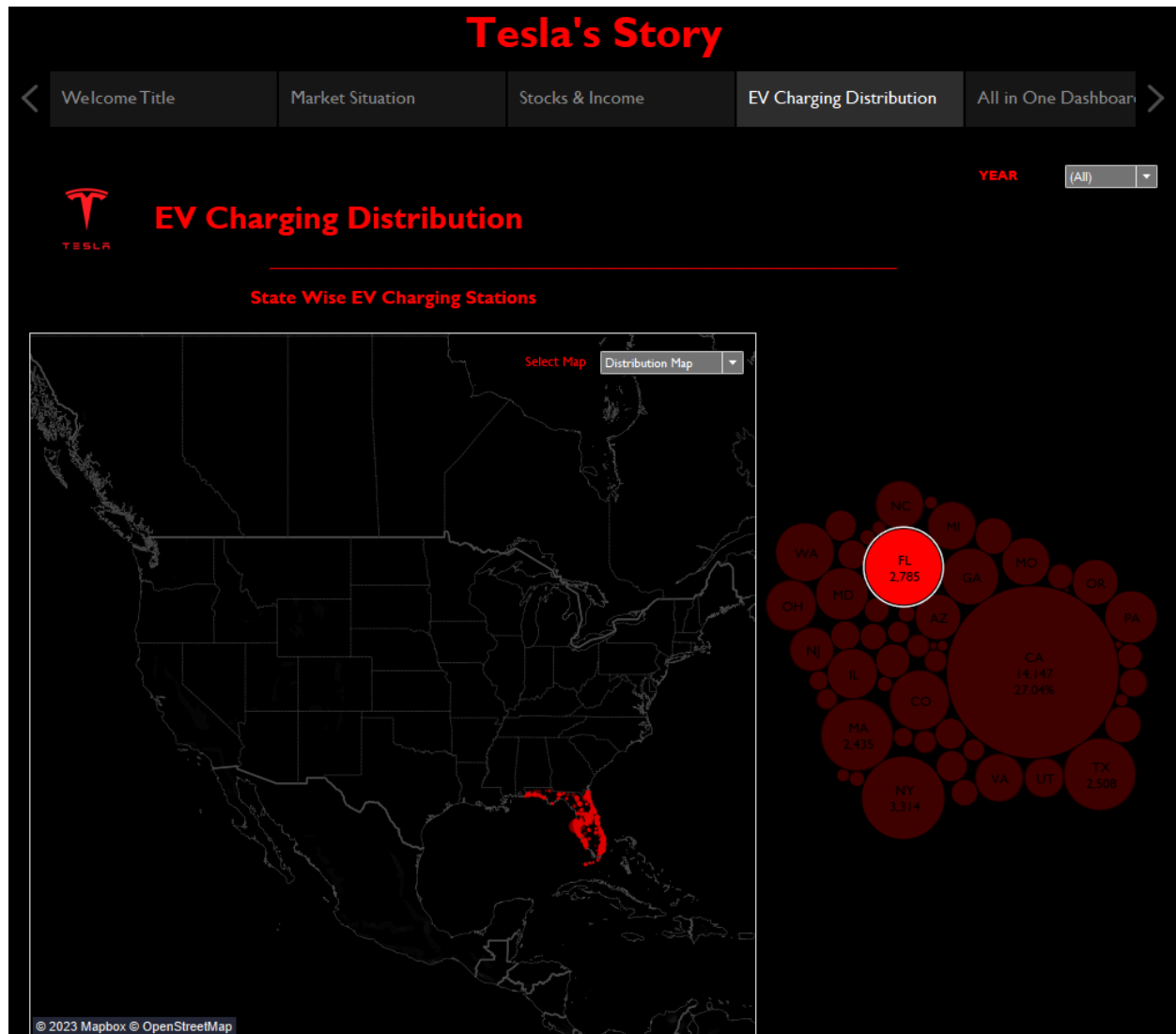
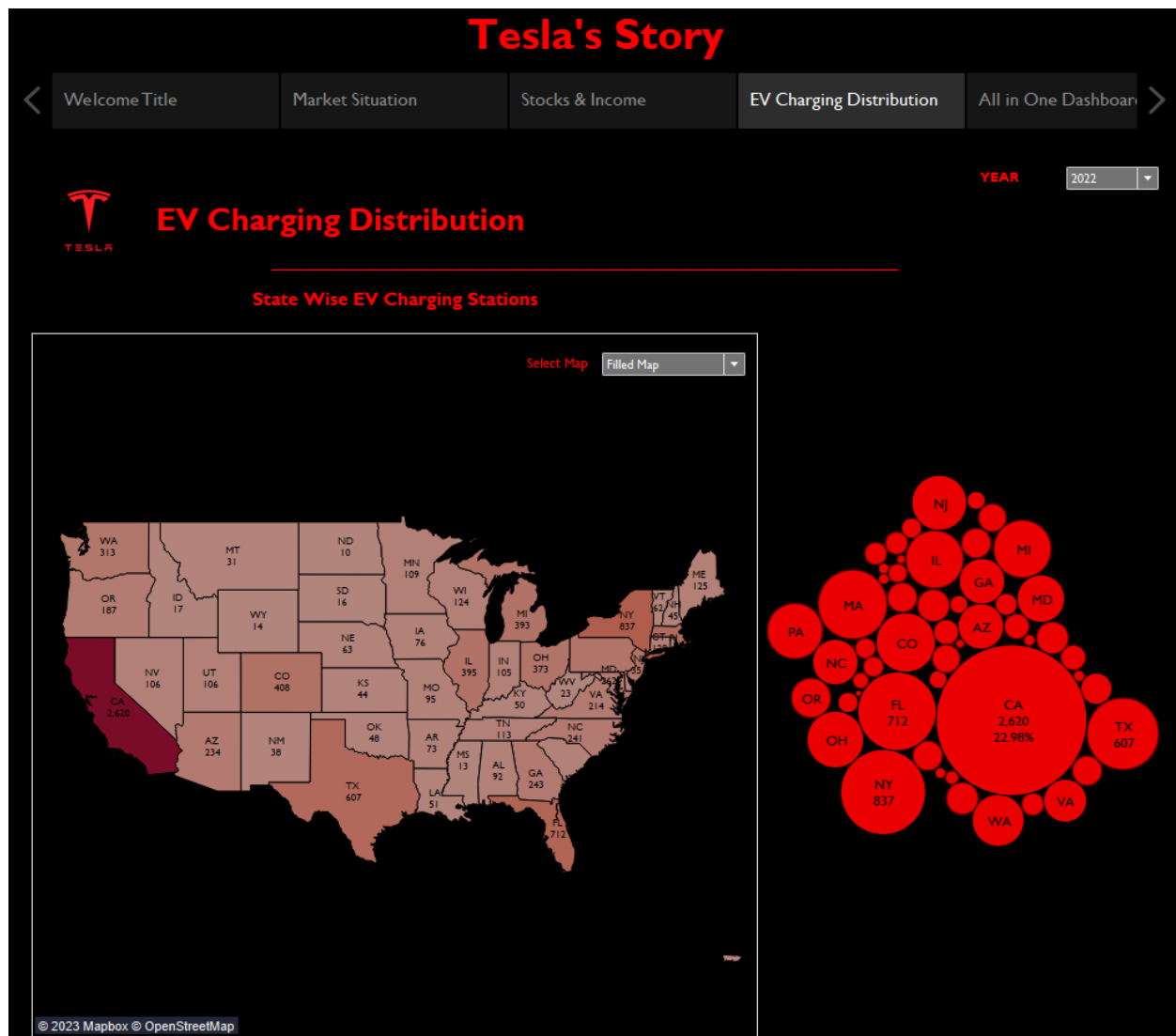Action connection: By linking the three maps together with the bubble map, users can select one or multiple states in the bubble map to visualize the distribution of electric vehicle (E.V.) charging stations in the corresponding states on the three maps.

Drill-down:

Filter: Year & State.

The year filter in the upper right corner can obtain the data on specific years from the two displaying charts. I incorporated drill-down functionality into this dashboard. As shown in the screenshot above, I have access to a complete map of the United States showing the locations and specific number of new charging stations that opened in each state in 2022. Additionally, it remains user-friendly and intuitive, even as the complexity of the data increases.

Also, it can help users to understand the relationships between different variables better and

identify patterns.

2.4 Dashboard 4: All in one
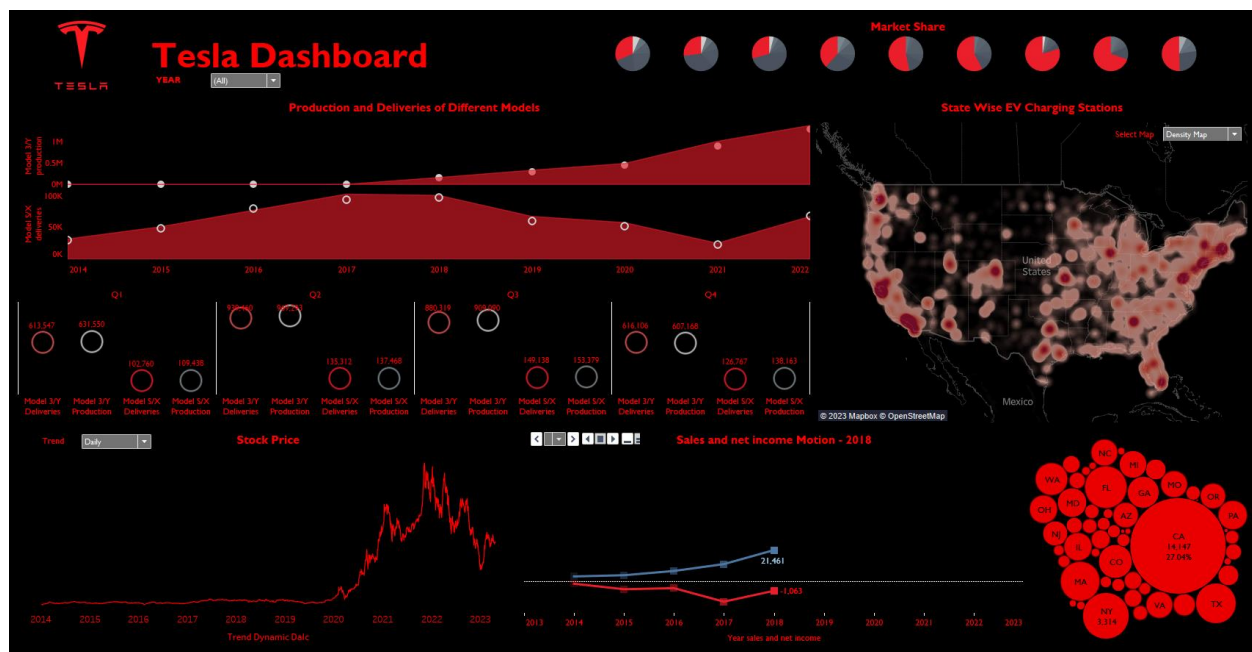
I combined the above three dashboards.

Actions feature: Additionally, the Actions feature has been added to the dashboard,

which allows users to filter specific data by year. This can be done using the year filter below

the dashboard's title.

Other: Set theme color, add a logo, set the different colors in the charts, set format, set

background format, and set font format.

3. Summary

The above dashboards have highly interactive features. It means the users can interact with the data presented in the dashboard and modify how it is displayed by multiple features, such as filters, drill down, animations, action, etc.

For example, on the dashboard that displays Tesla's stock and income, users may use filters to pick certain years and trend filter techniques to present the appropriate data. Users may also hover over the data points to get additional information about them or click on them to see more comprehensive visualizations. Individuals may learn more about Tesla's financial and stock performance through data exploration.

Similarly, in the dashboard that displays the distribution of electric car charging stations in the United States, users may utilize interactive maps to zoom in and out of certain areas or cities to examine the position and specifics of the charging stations.

Additionally, incorporating drill-down functionality into my Tableau dashboard is a valuable addition, and it is one of the important ways to unlock new insights from the data.

In conclusion, the interactive nature of these dashboards enables users to examine the data more interestingly and meaningfully, get insights that might not be visible in static charts, and ultimately make better business decisions based on the information offered.

4. 3W

4.1 What went well?

In this project, the following tasks were completed smoothly:

Partial data source search: Collecting most data sources was relatively easy, as much data could be found in the quarterly reports on Tesla's official website.

Making charts: The overall process of making Tableau Dashboard was relatively smooth. The experience gained from creating a Netflix analysis dashboard helped me make maps and add filters to charts.

Making Dashboard: Combining these charts was relatively smooth. Following Professor Ryan's lecture on how to link two charts to make them interact, an interactive chart of a map and a bubble chart were created.

4.2 What did not go well?

Limited availability of a specific type of data source: Since Tesla is a popular brand with fewer customers, I realized that clean and relevant data for a Tesla consumer satisfaction survey took much work. There needed to be more data to support my original plan of creating a radar chart. After extensive searching online, I could not find any usable and reliable publicly available data sources. As a replacement solution, I planned to use Python to crawl user reviews from major vehicle trading platforms, extract the keywords, and create a word cloud in Tableau. However, my laptop CPU might need to be more powerful; I faced a performance issue when I tried to create a word cloud from a large amount of text data in Tableau could. I decided to try this solution next time using my desktop computer.

Organized data: This was also a somewhat challenging process. Since the project topic had no precedent on the internet, there was no readily available database. Apart from the data on electric car charging stations and some financial reports, all the other data was extracted

manually from scattered data sources, such as multiple reports and various database websites, and then formatted for use.

Dashboard design: The challenge encountered in this project was also related to dashboard design. Initially, the goal was to create an all-in-one dashboard that provides users with a comprehensive view of the data. However, this approach could have been more effective as it made reading and obtaining key insights difficult. As a solution, the dashboard was divided into three parts according to topics, making it clearer and easier to understand. This required additional time and effort but ultimately improved the effectiveness of the dashboard.

4.3 What I would do differently next time?

Next time, I might consider the following things that could be done differently in a similar project in the future:

Search for more alternative data sources early: I recognized that starting the search for relevant and reliable data sources early on in the project is important. However, I learned that searching for alternative data sources is also important. If the preferred data sources are unavailable or my laptop is not supported for operating it, I could use my plan B.

Use more powerful hardware: If I were to do this project again, another thing I would do differently is to use more powerful hardware. Specifically, I faced a performance issue when dealing with a large amount of text data in Tableau to create a word cloud due to the limited processing power of my laptop's CPU. Therefore, next time I would use my desktop computer or another machine with higher processing power to complete the task more efficiently.

Consider dashboard design: While an all-in-one dashboard may seem like a good idea initially, there may be more effective ways to present the data. Next time, consider more alternative dashboard designs and layouts early in the project planning phase to make sure the dashboard communicates the key insights.

However, this was still an interesting exploratory project. It was my first time manually extracting and formatting data from scattered sources to create a usable dataset. This experience deepened my passion for this technology, especially after seeing the result.