National Forensic Sciences University

Knowledge | Wisdom | Fulfilment

An Institution of National Importance
(Ministry of Home Affairs, Government of India)

MINOR PROJECT (MBABI–SIII–6) REPORT

ON

"Tesla Stock Analysis "

Submitted To

School of Management Studies,

National Forensic Sciences University

MASTER OF BUSINESS ADMINISTRATION

In

BUSINESS ANLYTICS AND INTELLIGENCE

(Semester – III)

Submitted By

Vidhi Patel

(En.No.012300400013002029)

Under the Supervision of

Dr. Vivek Vyas

National Forensic Sciences University,

Gandhinagar Campus, Gandhinagar – 382009, Gujarat, India.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my mentor, Dr. Vivek Vyas, for his continuous guidance, valuable insights, and unwavering support throughout this project. His encouragement and expert advice have been crucial in the successful completion of this work. I also extend my appreciation to all the resources that facilitated my research and analysis.

With Sincere Regards,

Vidhi Patel

MBA in Business Analytics and Intelligence

TABLE OF CONTENTS

Contents

ABSTRACT

This project focuses on analyzing Tesla's stock performance from 2010 to 2020, utilizing Python for data analysis and Power BI for visualization. The goal is to identify trends, volatility, and key factors influencing Tesla's stock price. Using historical data sourced from Kaggle, the analysis explores Tesla's growth trajectory, market fluctuations, and the impact of external factors such as product launches and market disruptions. Key techniques such as moving averages and data visualization were employed to uncover meaningful insights. The project provides valuable information for investors, helping them make informed decisions based on past stock performance, while also identifying opportunities for future research in predictive modelling and competitor comparison.

INTRODUCTION

Tesla, Inc., a leader in the electric vehicle (EV) market, has redefined the automotive industry with its focus on innovation, sustainability, and renewable energy solutions. Since its inception, Tesla has consistently driven forward the adoption of EVs, becoming a global icon for cutting-edge technology and clean energy. However, Tesla's journey has not been without challenges. Its stock performance has often been influenced by factors such as market competition, production scalability, and broader economic trends.

This project analyses Tesla's historical stock data from 2010 to 2020 to uncover insights about its performance. By leveraging Python for data analysis and Power BI for creating intuitive visualizations, the analysis focuses on identifying key trends, price patterns, and significant milestones in Tesla's stock history.

The significance of this analysis lies in its ability to provide actionable insights for investors and stakeholders. Understanding the historical trends and patterns in Tesla’s stock can help in forecasting its future trajectory and assessing investment risks.

LITERATURE SURVEY

The electric vehicle (EV) market has grown rapidly, with Tesla leading the charge through innovation and sustainability. Despite its dominance, Tesla faces challenges such as rising competition from traditional automakers and production issues like supply chain disruptions.

From the 2010–2020 dataset, Tesla's stock showed steady growth but with periods of high volatility influenced by events like product launches, earnings reports, and market disruptions. Significant spikes were noted during key milestones, such as achieving profitability in 2019, while dips reflected production delays and external pressures. This analysis provides essential insights into Tesla’s stock behaviour, helping investors understand market dynamics and associated risks.

PROBLEM STATEMENT

Tesla's rapid growth in the electric vehicle (EV) industry has made it a dominant player, but this success has come with significant challenges. The increasing competitiveness of the EV market, with established automakers entering the space, poses a threat to Tesla's market share. Moreover, Tesla's stock performance has been influenced by internal and external factors such as production delays, supply chain issues, and market volatility.

The project addresses the following core issues:

1. **Understanding Historical Trends**: Identifying patterns in Tesla's stock performance to uncover long-term trends and short-term fluctuations.

2. **Assessing Market Volatility**: Analysing how Tesla's growth phases and external pressures, such as economic shifts or competitor strategies, impact stock prices.

3. **Informed Decision-Making**: Providing insights for investors to understand Tesla's stock behaviour and make data-driven decisions amidst evolving market dynamics.

By focusing on Tesla's historical stock data (2010–2020), the project aims to provide a detailed analysis of the factors influencing its stock performance and their implications for future trends.

COMPONENT / TOOLS USED

This project utilized Python and Power BI to analyse Tesla's stock performance (2010–2020). Each tool and library contributed to handling, analysing, and visualizing the dataset effectively:

Python

- **Pandas**: Used to load the Tesla dataset, clean missing values, and filter stock data. It enabled critical data preprocessing steps, such as calculating daily returns and identifying trends in closing prices.
- **NumPy**: Calculated statistical measures like 20-day moving averages, which smoothed the stock data and helped identify long-term trends.
- **Matplotlib and Seaborn**: These libraries were used to visualize Tesla's daily closing prices, moving averages, and volatility patterns. For instance, line charts and boxplots revealed periods of high fluctuation in stock prices.
- **Datetime**: Simplified the management of time-series data, enabling proper indexing and segmentation of Tesla's stock by years or specific periods.

Power BI

- The dashboard created in Power BI illustrated Tesla's stock performance trends interactively. Visuals like time-series graphs, moving average trends, and volatility indicators highlighted critical insights such as a consistent upward trajectory with spikes during major announcements (e.g., the Model 3 release or achieving profitability in 2019).

BLOCK DIAGRAM

The block diagram represents the step-by-step workflow of the Tesla Stock Analysis project. Each step corresponds to a specific action taken during the data analysis process.

1. Data Collection

- Source: Historical stock data for Tesla (2010–2020) obtained from Kaggle.
- Format: CSV file containing attributes like Date, Open, High, Low, Close, Adj Close, and Volume.

2. Data Preprocessing

- **Load Dataset**: Using Python (pandas' library) to load the dataset into a Data Frame.
- **Handle Missing Values**: Checking for and addressing any null or missing data points.
- **Format Dates**: Using the datetime library to format and set the Date column as the index for time-series analysis.

3. Exploratory Data Analysis (EDA)

- **Descriptive Statistics**: Summarizing key statistics (e.g., mean, median, standard deviation of closing prices).
- **Trend Analysis**: Plotting the Close prices over time to identify trends (e.g., bullish or bearish periods).
- **Moving Averages**: Calculating and visualizing a 20-day moving average to smooth fluctuations and highlight long-term trends.
- **Volatility Analysis**: Using boxplots to visualize price variability over time.

4. Data Visualization

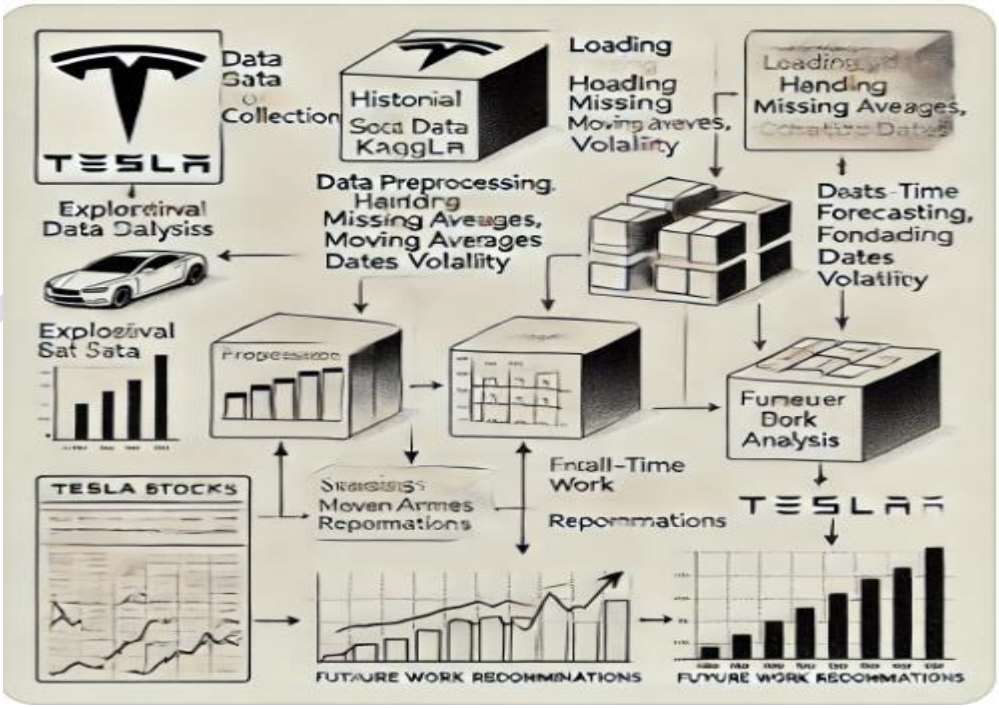
- **Python Visualizations**: Creating static graphs using matplotlib and seaborn (e.g., line plots for daily closing prices and moving averages).
- **Power BI Dashboard**: Designing an interactive dashboard to visualize key metrics and trends, allowing dynamic exploration of the data.

5. Insights and Reporting

- Extracting key findings, such as periods of high volatility or major stock performance milestones (e.g., Tesla's profitability in Q3 2019).
- Preparing a comprehensive report with visual aids from Power BI and Python to summarize results for stakeholders.

6. Future Work Recommendations

- Proposing additional analyses, such as real-time stock forecasting or comparative analysis with competitor stocks.



IMPLEMENTATION & RESULT

Data Pre-Processing:

- **. Import necessary Libraries and Read the CSV file:**

```
1  import pandas as pd
2  import numpy as np
3  import matplotlib.pyplot as plt
4
```

```
[4]  1  df = pd.read_csv("/content/TSLA dataset.csv")
     2  print(df)
```

```
           Date        Open        High         Low       Close   Adj Close  \
0      6/29/2010   19.000000   25.000000   17.540001   23.889999   23.889999
1      6/30/2010   25.790001   30.420000   23.299999   23.830000   23.830000
2       7/1/2010   25.000000   25.920000   20.270000   21.959999   21.959999
3       7/2/2010   23.000000   23.100000   18.709999   19.200001   19.200001
4       7/6/2010   20.000000   20.000000   15.830000   16.110001   16.110001
...          ...         ...         ...         ...         ...         ...
2411   1/28/2020  568.489990  576.809998  558.080017  566.900024  566.900024
2412   1/29/2020  575.690002  589.799988  567.429993  580.989990  580.989990
2413   1/30/2020  632.419983  650.880005  618.000000  640.809998  640.809998
2414   1/31/2020  640.000000  653.000000  632.520020  650.570007  650.570007
2415    2/3/2020  673.690002  786.140015  673.520020  780.000000  780.000000

         Volume
0      18766300
1      17187100
2       8218800
```

- **Find the null and Duplicated value in data:**

```
[ ]  1  df.isnull().sum()
```

	0
Date	0
Open	0
High	0
Low	0
Close	0
Adj Close	0
Volume	0

dtype: int64

- **Basic Functions:**

```
1  df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2416 entries, 0 to 2415
Data columns (total 7 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   Date       2416 non-null   object 
 1   Open       2416 non-null   float64
 2   High       2416 non-null   float64
 3   Low        2416 non-null   float64
 4   Close      2416 non-null   float64
 5   Adj Close  2416 non-null   float64
 6   Volume     2416 non-null   int64  
dtypes: float64(5), int64(1), object(1)
memory usage: 132.2+ KB
```

- **Columns Name:**

```
1  df.columns
```

```
Index(['Date', 'Open', 'High', 'Low', 'Close', 'Adj Close', 'Volume'], dtype='object')
```

```
1  df.nunique()
```

	0
Date	2416
Open	2132
High	2128
Low	2136
Close	2225
Adj Close	2225
Volume	2391

dtype: int64

- **Descriptive Statistics:**

```
1  df.describe()
```

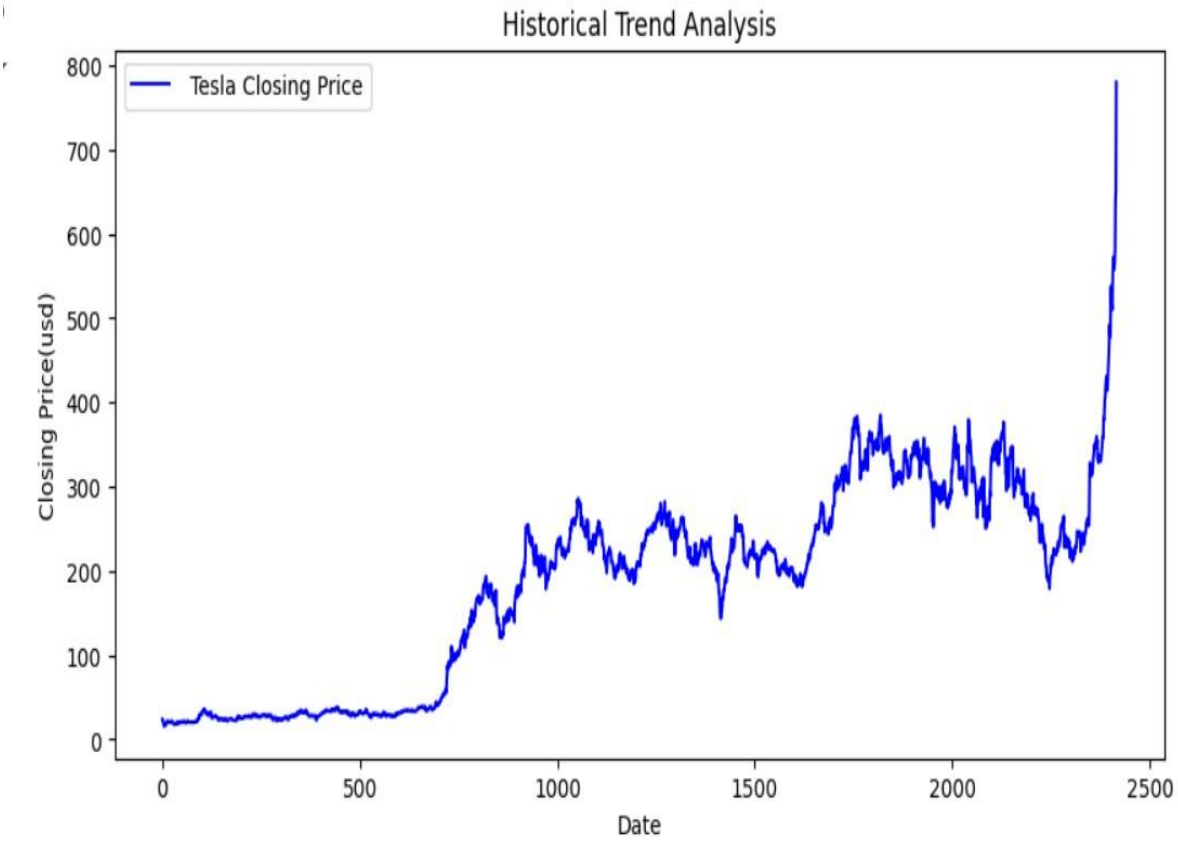
	Open	High	Low	Close	Adj Close	Volume
count	2416.000000	2416.000000	2416.000000	2416.000000	2416.000000	2.416000e+03
mean	186.271147	189.578224	182.916639	186.403651	186.403651	5.572722e+06
std	118.740163	120.892329	116.857591	119.136020	119.136020	4.987809e+06
min	16.139999	16.629999	14.980000	15.800000	15.800000	1.185000e+05
25%	34.342498	34.897501	33.587501	34.400002	34.400002	1.899275e+06
50%	213.035004	216.745002	208.870002	212.960007	212.960007	4.578400e+06
75%	266.450012	270.927513	262.102501	266.774994	266.774994	7.361150e+06
max	673.690002	786.140015	673.520020	780.000000	780.000000	4.706500e+07

Historical Trend Analysis:

- To analyze Tesla’s historical stock performance by identifying trends and patterns over time.
- The historical trend analysis of Tesla's stock from 2010 to 2020 highlights its evolution from a niche electric vehicle company to a global leader in innovation. During the early years (2010-2012), Tesla’s stock price remained relatively stagnant, reflecting limited investor attention and lower trading volumes. This period was marked by Tesla's focus on product development, including the successful launch of the **Model S**, which laid the foundation for future growth.
- Between **2013 and 2014**, Tesla’s stock entered a significant bullish phase, experiencing rapid price growth. The success of the **Model S** and the expansion of Tesla’s **Supercharger network** were pivotal in boosting investor confidence, driving demand, and establishing Tesla as a key player in the electric vehicle market.
- From **2015 to 2016**, Tesla faced challenges such as production delays and rising competition, which resulted in stagnation and minor declines in its stock price. However, the company rebounded between **2017 and 2018**, reaching its peak stock performance during this period. This growth was fueled by the success of the **Model 3**, Tesla’s affordable mass-market electric car, along with increasing global adoption of EVs. Despite this, volatility also grew due to operational challenges and investor scrutiny.
- Towards the end of the decade (2019-2020), Tesla’s stock experienced a downward correction. This decline reflected market adjustments, production concerns, and broader economic uncertainty.
- In summary, Tesla’s stock performance from 2010 to 2020 showcases its transition from slow growth to a period of significant highs, driven by innovation and product milestones, with intermittent challenges and volatility shaping its trajectory.

```
# Historical trend anaysis:
plt.figure(figsize=(10,5))
plt.plot(df['Close'],  label=' Tesla Closing Price', color='blue')
plt.xlabel('Date')
plt.ylabel('Closing Price(usd)')
plt.title('Historical Trend Analysis')
plt.legend(loc='upper left')
plt.show()

```

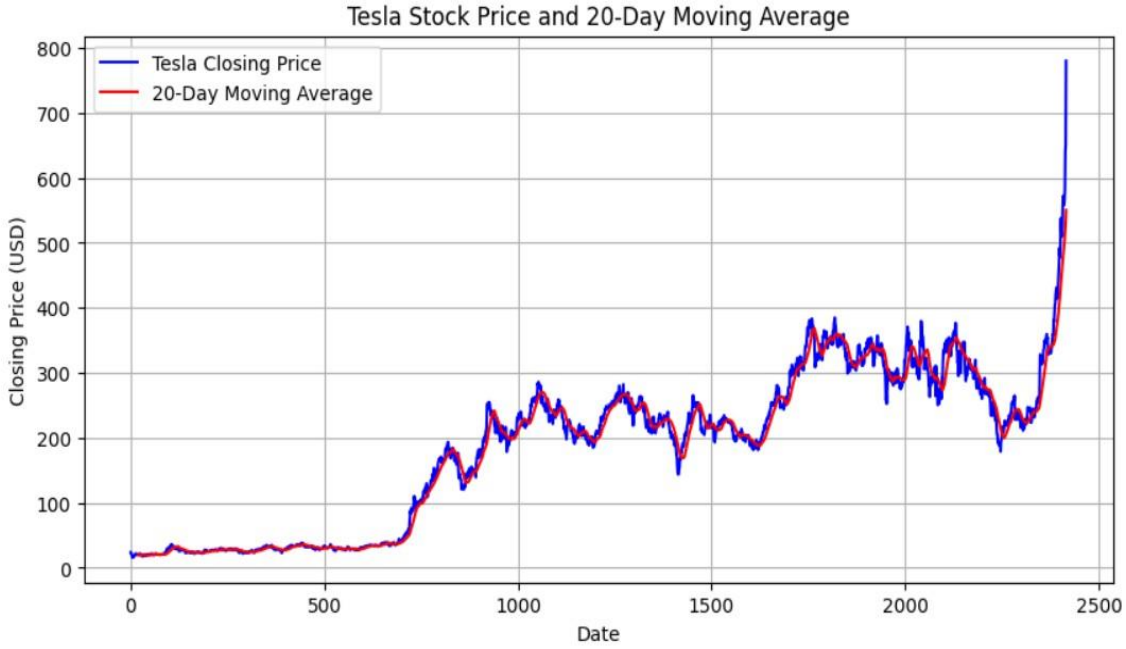
-



Moving Average Calculation for Smoothing Stock Price Trendstock:

- To calculate and plot a 20-day moving average for Tesla's stock prices to smooth out short-term fluctuations and identify long-term trends.
- A moving average is a common method to smooth time series data and make it easier to see the underlying trend.
- The 20-day moving average helps filter out daily price volatility, making it easier to identify longer-term trends.

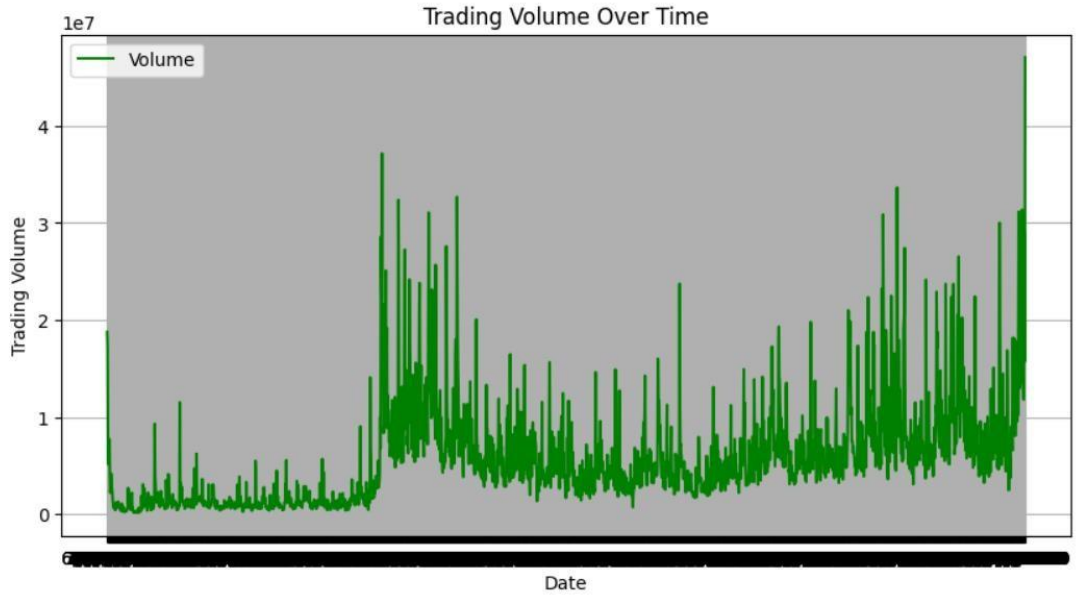
```
# Assuming df contains 'Date' and 'Close' columns
df['20_MA'] = df['Close'].rolling(window=20).mean()
plt.figure(figsize=(10, 5))
plt.plot(df['Close'], label='Tesla Closing Price', color='blue')
plt.plot(df['20_MA'], label='20-Day Moving Average', color='red')
plt.xlabel('Date')
plt.ylabel('Closing Price (USD)')
plt.title('Tesla Stock Price and 20-Day Moving Average')
plt.legend()
plt.grid(True)
plt.show()
```


Tesla Stock Price and 20-Day Moving Average
Tesla Closing Price
20-Day Moving Average
Closing Price (USD)
Date
0
100
200
300
400
500
600
700
800
0
500
1000
1500
2000
2500

Trading volume time:

- The graph visualizes "Trading Volume Over Time," showing the changes in the trading volume of a particular stock or asset over a period.
- The x-axis represents the dates, while the y-axis represents the trading volume.
- The green line plots the volume values, indicating fluctuations in trading activity over time.

```python
# plot trading volume over time:
plt.figure(figsize=(10,5))
plt.plot(df['Date'], df['Volume'],label='Volume', color='green')
plt.xlabel('Date')
plt.ylabel('Trading Volume')
plt.title('Trading Volume Over Time')
plt.legend()
plt.grid(True)
plt.show()
```

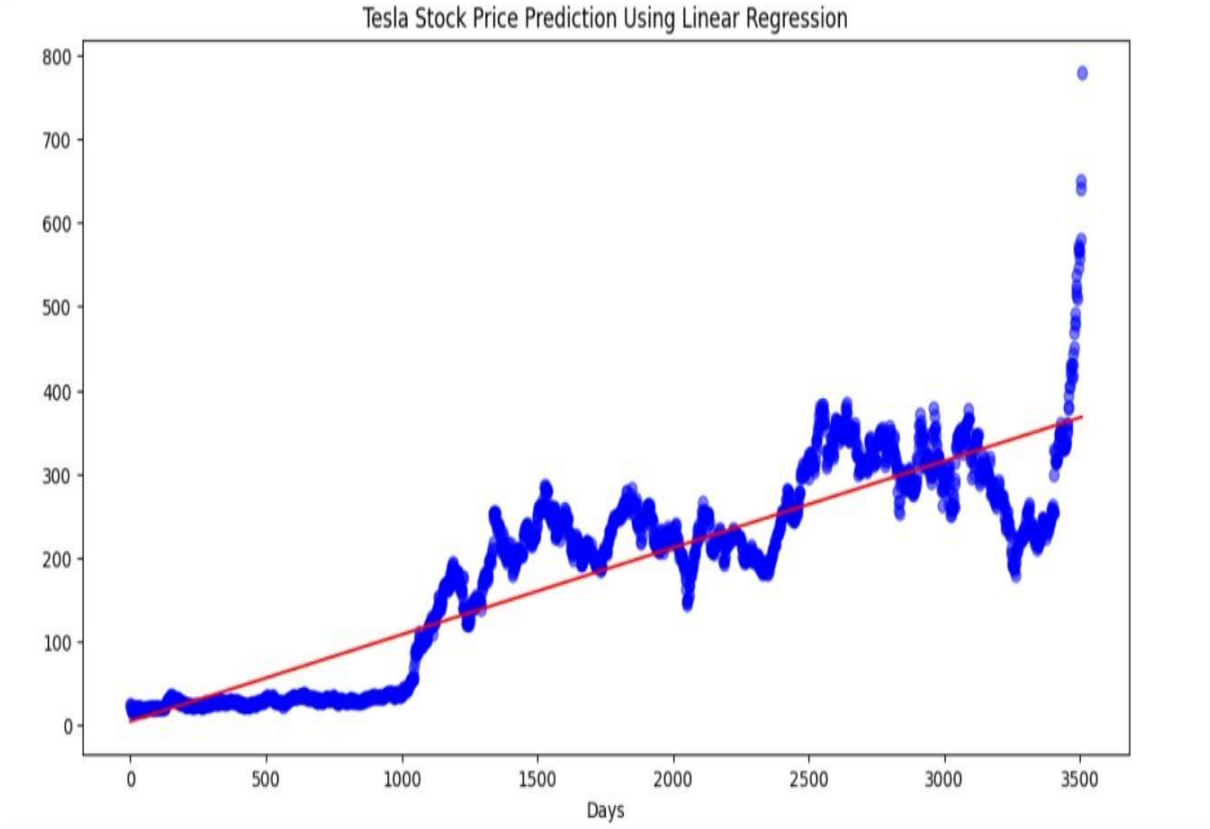


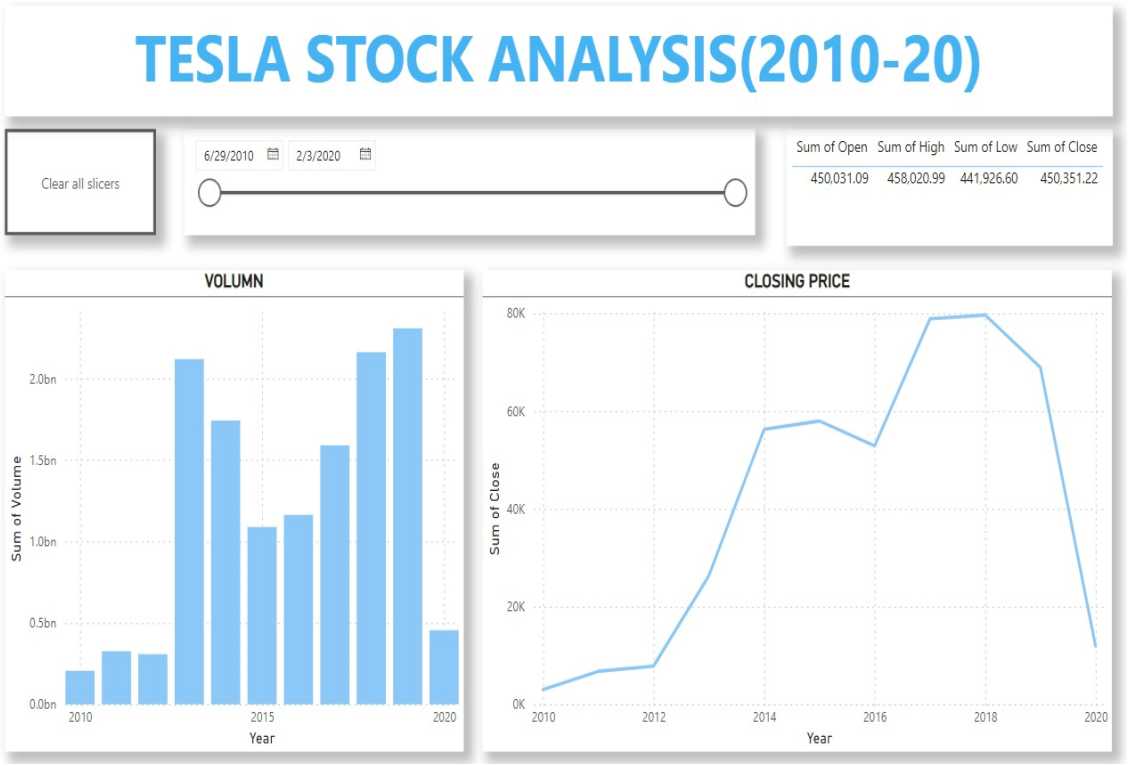
Machine learning model:

- linear regression model used to predict Tesla's stock prices.
- A **Linear Regression model** is implemented to predict Tesla's stock prices. To create this model, the feature **"Days Since Start"** is used as the input variable, representing the number of days from the start of the analysis period, while the **closing price** serves as the target variable.
-
- The dataset is split into **training and testing sets**, with the training set used to fit the model.
- The Linear Regression model learns the relationship between time (Days Since Start) and Tesla's closing stock price.
- The resulting graph visually compares the **actual stock prices** (represented by **blue points**) with the **predicted prices** (red line).
- The red line reflects the linear trend captured by the model. While the model successfully identifies the general upward trend in Tesla's stock price, it falls short in capturing the **volatility and non-linear dynamics** of Tesla's stock performance.
- This limitation arises because **linear regression** assumes a straight-line relationship between the input and output variables. Tesla's stock prices, influenced by external factors like market sentiment, company developments, and macroeconomic events, often exhibit **non-linear and complex patterns**.
- Therefore, while the Linear Regression model provides a baseline understanding, it is too simplistic and lacks the flexibility to accurately predict such a volatile stock.
- In conclusion, although the Linear Regression model captures the overall trend, its inability to model non-linearity and volatility reduces its predictive accuracy for Tesla's stock prices.
- More advanced models, such as **LSTM, ARIMA**, or **decision trees**, would be better suited for handling such complex data.

```python
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression

# Ensure 'Date' is in datetime format
df['Date'] = pd.to_datetime(df['Date'])

# Feature: Days since the first date
df['Days Since Start'] = (df['Date'] - df['Date'].min()).dt.days

# Prepare features (X) and target (y)
X = df[['Days Since Start']]
y = df['Close']

# Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
random_state=42)

# Train the linear regression model
model = LinearRegression()
model.fit(X_train, y_train)

# Predict using the model
predictions = model.predict(X)

# Plot actual vs predicted prices
plt.figure(figsize=(12, 6))
plt.scatter(X, y, label='Actual Prices', alpha=0.5, color='blue')
plt.plot(X, predictions, label='Predicted Prices', color='red')
plt.title('Tesla Stock Price Prediction Using Linear Regression')
plt.xlabel('Days')
```

```
Text(0.5, 0, 'Days')
```




TESLA STOCK ANALYSIS(2010-20)
Clear all slicers
6/29/2010
2/3/2020
Sum of Open
Sum of High
Sum of Low
Sum of Close
450,031.09
458,020.99
441,926.60
450,351.22
VOLUMN
Sum of Volume
2.0bn
1.5bn
1.0bn
0.5bn
0.0bn
2010
2015
2020
Year
CLOSING PRICE
Sum of Close
80K
60K
40K
20K
0K
2010
2012
2014
2016
2018
2020
Year

1.Bar Chart:

This bar chart shows the total trading *volume* of Tesla stock for each year between 2010 and 2020. Volume represents the total number of shares traded during a specific time frame.

Key Insights:

- The trading volume shows a significant increase around 2013 and remains high through 2017-2019.
- A sharp decline in volume is observed in 2020 compared to previous years.
- Possible reasons for the spikes could include major events like product launches, investor interest, stock splits, or overall market trends.
- 2013 and 2018 show the highest trading volumes (above *2 billion shares*).
- The earlier years (2010-2012) show much lower trading activity, indicating Tesla was less prominent in the market during that time.

---

2. Closing Price (Line Chart)

This line chart illustrates Tesla's *sum of closing prices* across the years 2010 to 2020. The closing price is the final price at which Tesla's stock traded at the end of a trading session.

Key Insights:

- From 2010 to 2013, the closing price remained relatively low, reflecting Tesla's early growth phase.
- A sharp upward trend is visible between 2012 and 2014, indicating a period of strong investor confidence and rapid growth.
- Between 2015 and 2016, the price experienced a slight dip or stagnation.
- A significant peak occurred in 2018, where the sum of the closing price reached its maximum value (around *80K*).
- Post-2018, a decline is observed, and by 2020, the closing price dropped sharply again.
- Tesla's steep price growth around 2013-2018 aligns with its rise in popularity, production milestones (e.g., Model S/Model 3 success), and increased investor confidence.
- The drop post-2018 may be linked to market corrections or challenges faced by the company.

3.Metrics Shown:

- Sum of Open: **450,031.09**
- Sum of High: **458,020.99**
- Sum of Low: **441,926.60**
- Sum of Close: **450,351.22**
- These values represent the aggregate stock price (opening, high, low, and close) for the entire period (2010-2020).

Conclusion:

- The graphs highlight Tesla's journey from a low-volume, low-price stock to a high-volume, high-growth stock, peaking around 2018.
- This period reflects significant investor interest and Tesla's growing market presence.

The implementation of such a project is highly valuable for both investors and analysts in understanding Tesla's stock performance and making informed decisions. By analysing Tesla's historical stock data, the project provides insights into long-term trends, price volatility, and the key factors influencing stock movements. This information is crucial for investors seeking to optimize their strategies, manage risks, and predict future stock behaviour. Additionally, the project highlights periods of high volatility and helps identify the external events—such as product launches or market shifts—that impact Tesla's stock. Overall, this project enables better decision-making in a competitive and dynamic market, making it a valuable tool for anyone involved in stock analysis or financial planning.

The results revealed a clear upward trajectory in Tesla's stock price, showing steady growth, particularly in recent years. However, the stock exhibited significant volatility, especially during key events like product launches, earnings reports, and market disruptions. The 20-day moving average helped smooth out short-term fluctuations, providing a clearer view of long-term performance trends. The insights from the analysis suggest that while Tesla's stock has experienced robust growth, investors must be cautious of the high volatility driven by external market factors and internal company developments.

FUTURE WORK & CONCLUSION

While this project provided a comprehensive analysis of Tesla's historical stock data, there are several areas for future work that could enhance the scope and depth of the analysis. One possible direction is incorporating real-time stock data to create dynamic models that track Tesla's stock performance on a daily basis. Additionally, integrating machine learning algorithms, such as predictive models for stock price forecasting, could provide more accurate insights into Tesla's future stock trends. Comparative analysis with competitor stocks, like those of other EV companies, would also offer valuable insights into Tesla's market position relative to its competitors. Another potential area of improvement is integrating sentiment analysis of news and social media, which could reveal how public sentiment affects stock price movements.

In conclusion, this project successfully analysed Tesla's stock data from 2010 to 2020, uncovering important trends and insights. The findings demonstrated a steady upward trajectory in Tesla's stock, albeit with significant volatility driven by various internal and external factors. Through the use of Python for data analysis and Power BI for visualization, the project provided valuable information for investors seeking to understand Tesla's stock behaviour. While the analysis offers a solid foundation for investment decisions, further work could enhance the accuracy and predictive power of the analysis by incorporating real-time data, advanced forecasting models, and broader market comparisons. This project highlights the power of data analytics and visualization in providing actionable insights for making informed financial decisions.

REFERENCES

Tesla Stock Dataset

The dataset used for this project was sourced from Kaggle, which provides a comprehensive collection of historical stock prices for Tesla. You can access the dataset here:

https://www.kaggle.com/datasets

Stock Analysis Websites

Yahoo Finance: A popular website offering extensive financial data, including historical stock prices, real-time data, and financial news. It is a reliable resource for analysing Tesla stock and other market trends.

Yahoo Finance