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STOCK MARKET ANALYSIS USING STATISTICAL TECHNIQUES

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Abstract: The project "Stock Market Analysis Using Statistical Techniques" aims to apply various statistical methods to analyze and gain insights into the stock market. Through the utilization of statistical techniques such as regression analysis, time series analysis, and correlation analysis, this project seeks to extract valuable information from historical stock data. The analysis conducted in this project focuses on identifying trends and patterns in stock price movements, understanding the factors that influence stock prices, and making predictions and forecasts for future stock prices. By analyzing historical data and applying statistical models, we aim to provide investors with valuable insights that can assist them in making informed investment decisions.

Keywords – Stock Market, Stocks, Trend, Trading.

I. INTRODUCTION

Stock Market is becoming one of the important topic in the finance sector and considered as a riskiest platform for an investing purpose.
The stock market is a stage where organizations can raise capital by selling proprietorship offers to the general population. It is a marketplace where investors buy and sell stocks, also known as equities. Shareholders of stocks are entitled to a portion of the company's assets and profits as well as a share of ownership.

Investors also use the stock market to make investments and accumulate wealth. Financial backers can trade stocks trying to produce returns, either through capital gains (the expansion in the stock's worth after some time) or profits (a piece of the organization's benefits paid out to investors).

The securities exchange is impacted by various variables, including the presentation of the economy, organization profit, international occasions, and financial backer opinion. The costs of individual stocks are impacted by market interest, as well as the hidden basics of the organization, like profit development, the board quality, and serious situation on the lookout.

There are two essential sorts of securities exchanges: secondary and primary Through initial public offerings (IPOs), businesses issue new stocks to the general public in the primary market. The auxiliary market is where stocks are exchanged among financial backers after they have been given in the essential market.

The stock market is a dynamic and complicated system that is very important to the economy. It gives organizations admittance to capital and financial backers with the potential chance to take part in the development and outcome of organizations. Notwithstanding, it likewise conveys chances and requires cautious thought and examination prior to going with speculation choices.

History of stock Market In India:

The history of the stock market in India dates back to the early 19th century when the country was under British colonial rule. The first stock exchange in India was the Bombay Stock Exchange (BSE), which was founded in 1875 as the Native Share and Stock Brokers Association. The BSE was established to provide a platform for trading stocks and other securities of Indian companies.

In the early days, trading in the Indian stock market was limited to a few brokers who traded mostly in cotton and other commodities. However, with the growth of the Indian economy and the rise of Indian industry in the early 20th century, the stock market began to expand.

The Calcutta Stock Exchange was established in 1908, followed by the Madras Stock Exchange in 1937. These exchanges provided a platform for trading securities of companies based in other parts of India.

After India gained independence in 1947, the government introduced regulations to regulate the stock market and protect investors. In 1956, the Securities Contracts (Regulation) Act was enacted, which provided a legal framework for the regulation of securities trading in India.

The National Stock Exchange (NSE) was founded in 1992 as India's first electronic stock exchange. The NSE was a game-changer for the Indian stock market as it introduced electronic trading, which made trading faster, more efficient, and more accessible to individual investors.

In 1994, the BSE introduced electronic trading, which further transformed the Indian stock market. Today, the Indian stock market is one of the largest and fastest-growing in the world, with two major stock exchanges, the BSE and the NSE, and many smaller exchanges.

The Indian stock market has played a crucial role in the country's economic growth, providing companies with access to capital and investors with the opportunity to participate in the growth and success of Indian businesses.

Stock exchanges in india:

There are several stock exchanges in India, but the two major exchanges are:

1. Bombay Stock Exchange (BSE): The BSE, established in 1875, is the oldest stock exchange in Asia and the first in India. It is located in Mumbai and has a market capitalization of over $2 trillion. The BSE lists over 5,500 companies and has over 7,000 trading members.

2. National Stock Exchange (NSE): The NSE was founded in 1992 and is the largest stock exchange in India by trading volume and market capitalization. It is located in Mumbai and lists over 2,000 companies. The NSE is known for its electronic trading platform and has over 1,900 trading members.

Other regional stock exchanges in India include:

- Calcutta Stock Exchange (CSE)
- Cochin Stock Exchange (CSX)
- Madras Stock Exchange (MSE)
- Delhi Stock Exchange (DSE)
- Ahmedabad Stock Exchange (ASE)
- Hyderabad Stock Exchange (HSE)

However, with the rise of electronic trading and consolidation in the Indian stock market, many of these regional exchanges have become inactive or have merged with larger exchanges.

Regulatory body in stock market:

The stock market's fair and transparent operation relies heavily on regulatory bodies. The Securities and Exchange Board of India (SEBI) is India's primary securities market regulator. After being established as a non-statutory body in 1988, the SEBI Act of 1992 gave it statutory powers.
The primary goals of SEBI are to safeguard the interests of securities investors, encourage the growth of the securities market, and regulate it. It is liable for directing all members in the protections market, including stock trades, dealers, stores, and common assets.
The following are some of SEBI's primary functions:

- Securities market regulation: The Securities and Exchange Board of India (SEBI) is in charge of enforcing compliance with regulations and establishing rules for all market participants.
- Market intermediary registration: Market intermediaries like brokers, depositories, and mutual funds are registered and regulated by SEBI to make sure they follow the rules.
- Market intermediaries under supervision: Market intermediaries are monitored by SEBI to make sure they are complying with their regulatory responsibilities and operating in an honest and open manner.
- Advancing financial backer instruction: SEBI works to raise investor awareness and education so that investors are aware of the risks and benefits of investing in the securities market.

The Indian stock market is also regulated by other regulatory bodies, such as the Reserve Bank of India (RBI) and the Ministry of Corporate Affairs (MCA), in addition to SEBI.

Key terms:

Intervals:
Intervals in the stock market refer to specific time frames or periods used for analyzing stock price movements or conducting trades. Different intervals are commonly used depending on the trading or investment strategy employed. Here are some common intervals in the stock market:

1) Intraday Intervals: Intraday intervals refer to time frames within a single trading day. They can range from seconds to minutes or hours. Traders who engage in day trading or short-term trading strategies often use intraday intervals to monitor price movements and execute trades within the same trading session.

2) Daily Intervals: Daily intervals represent a single day of trading activity. They capture the opening, closing, high, and low prices for a particular stock or market index. Daily intervals are commonly used by swing traders or medium-term investors to identify trends and make trading decisions based on the daily price movements.

3) Weekly Intervals: Weekly intervals represent a full week of trading activity. They provide a broader view of the market compared to daily intervals and are used by swing traders or investors with a longer time horizon. Weekly intervals help identify trends and patterns over a longer period.

4) Monthly Intervals: Monthly intervals encompass an entire month of trading activity. They are useful for long-term investors who are interested in understanding the overall trend and performance of a stock or market index over several months or years. Monthly intervals are often used to assess long-term investment opportunities and evaluate the performance of investment portfolios.

These intervals help traders and investors analyze stock price movements, identify trends, and make informed decisions based on their trading or investment strategies. The choice of interval depends on the trader's time horizon, risk tolerance, and specific objectives.

Tick Prices:

In the stock market, various price points are used to describe the trading activity of a particular stock. The key price points include:

High Price: The high price represents the highest traded price at which a stock was traded during a given period, typically within a specific trading day. It reflects the peak price level that the stock reached during that period.

Low Price: The low price represents the lowest traded price at which a stock was traded during a given period, usually within a specific trading day. It reflects the lowest price level that the stock reached during that period.

Close Price: The close price represents the final traded price of a stock at the end of a trading day. It is the last price at which the stock was traded before the market closes. The close price is often considered important as it can indicate the sentiment of market participants and is commonly used for calculating daily returns and charting.

Open Price: The open price is the first traded price of a stock at the beginning of a trading day. It is the price at which the stock starts trading when the market opens. The open price is important as it sets the initial reference point for the day's trading activity.

These price points provide valuable information about the trading range and price movements of a stock during a specific time period. They are commonly used for technical analysis, charting, and assessing the overall performance of a stock. Traders and investors often analyze these prices in conjunction with other indicators and patterns to make informed trading decisions.

Line Graph:

A line graph is a commonly used tool in the stock market to visually represent the price movements of a stock or an index over a specific period of time. It is constructed by plotting the closing prices of the stock or index on the vertical axis and the corresponding dates or time intervals on the horizontal axis.

In a line graph, each data point represents the closing price of the stock or index at a specific point in time. These data points are then connected with straight lines, forming a continuous line that shows the price trend over the given time period.

Line graphs provide a quick and intuitive way to observe the overall direction and magnitude of price movements. They can help identify trends, support and resistance levels, and key turning points in the stock's price history.

By examining the slope and steepness of the line, traders and investors can assess the momentum and strength of the price trend. Additionally, line graphs can be used to compare the price movements of multiple stocks or indices, allowing for relative performance analysis.

It's worth noting that while line graphs are useful for providing a general overview of price movements, they may not capture all the intraday fluctuations or other details that can be revealed through more detailed charting techniques, such as candlestick charts or bar charts.

Overall, line graphs serve as a valuable tool in technical analysis and provide a visual representation of price trends and patterns, aiding traders and investors in making informed decisions in the stock market.

Types of stocks:

There are a few kinds of stocks that financial backers can exchange the financial exchange. Some common types include:

Common Stocks: Normal stocks are the most well-known sort of stock that financial backers buy. At the point when individuals allude to "stocks" as a rule, they typically mean normal stocks. Common stockholders are entitled to dividends and voting rights, but they are last in line to receive assets in the event of a company bankruptcy.

Stock Options: Favored stocks are a class of stock that regularly offers a proper profit installment to investors. When compared to common stockholders, preferred stockholders have a greater claim on the earnings and assets of the company. However, preferred stockholders typically lack the right to vote.

Blue-Chip Securities: Blue-chip stocks allude to portions of huge, deep rooted, and monetarily stable organizations with a background marked by solid execution. These businesses are thought to be more stable and less volatile than smaller businesses due to their strong market presence.

Development Stocks: Companies that are anticipated to expand at a rate that is significantly higher than that of the market as a whole are the owners of growth stocks. These organizations ordinarily reinvest their benefits once again into the business to fuel extension as opposed to delivering profits.

Esteem Stocks: Esteem stocks are portions of organizations that are viewed as underestimated by the market. Financial backers search for esteem stocks that might be exchanging at a lower value comparative with their inborn worth or contrasted with the general market. Esteem stocks frequently have stable profit and may deliver profits.

Stocks with Dividends Dividend stocks are shares of businesses that regularly pay out dividends to shareholders in the form of a portion of their earnings. Investors who value regular income streams may find these stocks appealing.

Little Cap, Mid-Cap, and Huge Cap Stocks: Market capitalization is frequently used to classify stocks. The market capitalization of small-cap stocks is relatively low, that of mid-cap stocks is in the middle, and that of large-cap stocks is the highest. A company's potential risk and return profile and size can be determined by the classification.

Recurrent and Guarded Stocks: Companies whose performance tends to be closely linked to the overall economic cycle hold cyclical stocks. The state of the economy can have a significant impact on the value of these stocks. On the other hand, defensive stocks are held by businesses that tend to be more stable and less affected by economic downturns.

Area Explicit Stocks: A stock's industry or sector, such as technology, healthcare, financial services, consumer goods, energy, and others, can also be used to classify it. Based on their investment strategies and the outlook for the market, investors may decide to concentrate on particular industries.

It's essential to take note of that these classifications are not fundamentally unrelated, and many stocks can fall into numerous classes. In order to control their risk and achieve their investment objectives, investors frequently incorporate a variety of stock types into their diversified portfolios.

How to buy stocks in stock market?

To buy stocks in the stock market, follow these steps:

- Open a Demat and trading account: To invest in the stock market, you need to have a Demat account to hold the stocks and a trading account to execute trades. You can open these accounts with a broker or a bank that offers such services.

- Research stocks: Before investing in any stock, it's essential to research the companies you want to invest in. You can look at financial statements, news articles, and analyst reports to evaluate a company's financial health, growth potential, and market position.

- Place an order: Once you have selected the stocks you want to buy, you can place an order with your broker. You can place a market order, where you buy the stock at the prevailing market price, or a limit order, where you set a specific price at which you want to buy the stock.

- Pay for the stocks: After your order is executed, you need to pay for the stocks you have bought. The payment can be made through various modes such as net banking, debit card, or a cheque.

- Receive the stocks: Once you have paid for the stocks, they will be transferred to your Demat account. You can view your holdings and track their performance through your broker's online trading platform or mobile app.

It is important to note that investing in the stock market involves risks, and you should only invest what you can afford to lose. It is also advisable to seek professional advice before making any investment decisions.

Indices:

Lists in the securities exchange are utilized as a benchmark to quantify the general exhibition of the securities exchange or a particular area. A weighted average of a group of stocks that shows their performance over time is called an index. The following are some stock market indexes that are frequently used:

- ❖ Sensex BSE: The BSE Sensex is the most seasoned and most broadly followed list in India. Based on market capitalization, it monitors the performance of the top 30 companies listed on the Bombay Stock Exchange (BSE).

- ❖ Nifty 50: The Clever 50 is the benchmark file of the Public Stock Trade (NSE). Based on market capitalization, it monitors the performance of the 50 most valuable companies listed on the NSE.

- ❖ Midcap BSE: Based on market capitalization, the performance of mid-sized businesses listed on the BSE is tracked by the BSE Midcap index.

- ❖ Smallcap BSE: Based on market capitalization, the performance of small businesses listed on the BSE is tracked by the BSE Smallcap index.

- ❖ Ex: S&P BSE Bank India's banking industry is monitored by the S&P BSE Bankex. It includes the top ten banking stocks by market capitalization that are listed on the BSE.

- ❖ Nifty Medicine: India's pharmaceutical industry is monitored by the Nifty Pharma index. It includes the top ten pharmaceutical companies by market capitalization that are listed on the NSE.

Indexes enable investors to track the stock market's overall performance and make educated investment decisions. However, it is essential to keep in mind that investing in the stock market entails taking risks, and prior to making any investment decisions, investors ought to conduct adequate research.

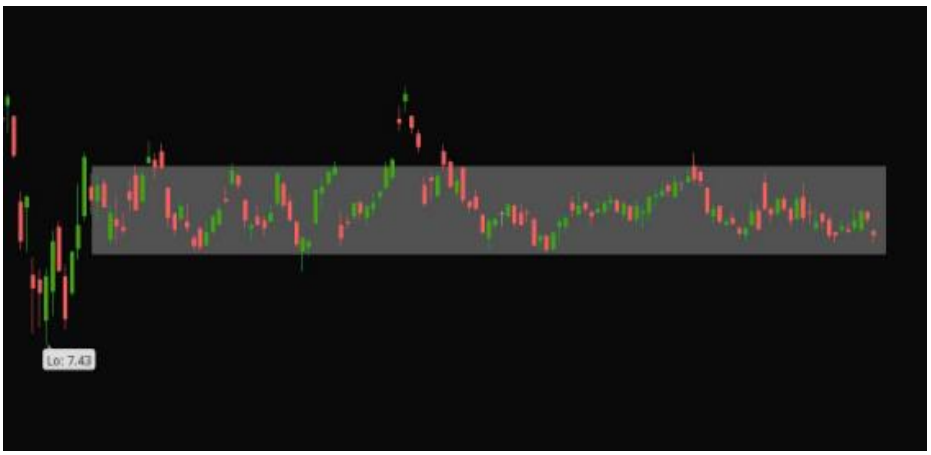
Trends

The stock market has three types of trends:

1. Uptrend: The majority of stocks are seeing their value rise, indicating a bullish trend in the stock market as a whole. Stocks are in high demand and investors are optimistic about the market's future prospects in an uptrend.

2. Downtrend: The majority of stocks are losing value, indicating a bearish trend in the stock market's overall direction. In a downtrend, financial backers are skeptical about what's to come possibilities of the market, and there is a low interest for stocks.

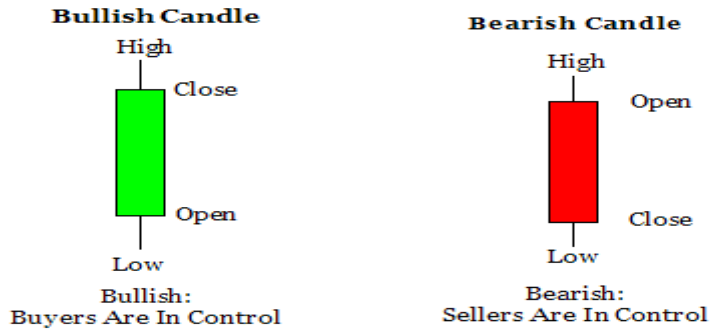
3. Sideways trend: This is a neutral trend in which the stock market's overall direction is unchanged and the majority of stock prices are fluctuating within a narrow range. Investors are uncertain about the market's future prospects during a sideways trend, and the market lacks clear direction.



It is essential to keep in mind that a variety of economic, political, and other factors influence stock market trends, which are not always predictable. Before making any investment decisions, investors should always conduct due diligence and be prepared for potential risks associated with investing in the stock market.

Candle Sticks:

In technical analysis, a bullish candle and a bearish candle are two types of candlestick patterns used to interpret price movements in the stock market.



A bullish candle is represented by a green or white candlestick, and it indicates that the closing price of a stock is higher than its opening price. This pattern is typically associated with positive sentiment among investors and traders, and it suggests that the price of the stock may continue to rise in the future.

In contrast, a bearish candle is represented by a red or black candlestick, and it indicates that the closing price of a stock is lower than its opening price. This pattern is typically associated with negative sentiment among investors and traders, and it suggests that the price of the stock may continue to fall in the future.

In addition to the color of the candlestick, other factors such as the length of the candle, the shadows or wicks on the candle, and the volume of trading can provide additional information about the strength and direction of the price movement.

It is important to note that candlestick patterns should not be used in isolation to make trading decisions, and traders should use other technical and fundamental analysis tools to confirm their decisions.

Investing and Trading in Stock Market :

There are two distinct ways to participate in the stock market: investing and trading.

Buying stocks and holding them for a long time is how you invest in the stock market to make money over the long term. The strength of the company's financials, its track record, and other fundamental factors are typically taken into consideration by investors when selecting stocks.

In contrast, trading on the stock market entails short-term stock purchases and sales with the aim of making quick profits from market fluctuations. Short-term stock price trends and patterns are typically identified by traders using technical analysis and other tools.

While both financial planning and exchanging can be productive, they have various dangers and prizes. Contributing requires a drawn out viewpoint and a readiness to weather conditions market variances, while exchanging requires a more prominent degree of expertise and discipline to make fruitful exchanges and oversee risk.

Ultimately, your investment objectives, risk tolerance, and time horizon will determine whether you trade or invest in the stock market. Before making any decisions regarding investments, it is essential to conduct research and speak with a financial professional.

Volatility:

The degree to which stock prices fluctuate or vary over a given time frame is referred to as the volatility of the stock market. It is a measure of the speed and magnitude of price changes as well as the instability of the market. The following are some significant points regarding the volatility of the stock market:

- Insecurity in the market: Financial exchange unpredictability frequently mirrors the degree of vulnerability and hazard apparent by financial backers. During times of uplifted vulnerability, like financial slumps, political insecurity, or worldwide occasions, market unpredictability will in general increment as financial backers respond to changing circumstances and change their venture procedures.

- Index of Volatility: The most broadly utilized proportion of securities exchange unpredictability is the CBOE Instability File (VIX), frequently alluded to as the "dread list." The VIX tracks the normal instability of the S&P 500 record, in light of choices costs. A higher VIX value indicates greater market volatility is anticipated.

- Volatility's Root Causes: Economic indicators, corporate earnings reports, geopolitical events, central bank actions, trade tensions, investor sentiment, and other factors can all contribute to stock market volatility. Volatility can rise as a result of news and events that have an effect on investor expectations and confidence.

- Effect on Decisions About Investments: Investing strategies and decisions can be influenced by volatility. High instability might hinder a few financial backers who incline toward additional steady speculations, while others might consider it to be a chance for possible increases through transient exchanging or dynamic portfolio the board. Risk management strategies as well as the pricing of options and derivatives can be impacted by volatility.

- Instability and Long haul Effective financial planning: It is essential to keep in mind that volatility does not necessarily reflect a company's long-term value or prospects, despite the fact that volatility in the stock market can result in price fluctuations in the short term. Instead of focusing on the volatility of the short term market, long-term investors frequently focus on the fundamentals, performance, and growth prospects of the company.

- Management of Risk and Volatility: Unpredictability is a significant thought in risk the executives. Enhancement, resource allotment, and the utilization of supporting systems, like choices or fates, are a portion of the methods financial backers use to oversee and moderate the effect of market unpredictability on their portfolios.

- Trading Techniques and Volatility: Momentum trading, volatility arbitrage, and options trading are among the strategies that some traders actively employ to take advantage of market volatility. The goal of these strategies is to make money from changes in market volatility and short-term price movements.

It's essential to take note of that securities exchange instability is inborn and can happen across various time spans and economic situations. Financial backers ought to evaluate their gamble resistance, venture objectives, and time skyline while exploring the securities exchange, taking into account the expected effect of instability on their speculation choices.

Factors affecting share prices in stock market:

A few variables can impact share costs in the financial exchange. Here are a few critical elements to consider:

- Organization Execution: The monetary exhibition of an organization, including its income, income, overall revenues, and development possibilities, can essentially influence its portion cost. Positive execution pointers frequently lead to an expansion in share costs, while negative execution can make them decline.

- Financial Variables: More extensive monetary circumstances, for example, Gross domestic product development, expansion rates, loan fees, and government arrangements, can impact share costs. A strong economy by and large backings higher offer costs, while monetary slumps or negative strategies can prompt decays.

- Industry and Area Execution: Execution and patterns inside unambiguous ventures or areas can influence the offer costs of organizations working inside them. Factors like innovative headways, administrative changes, and shopper request examples can influence industry and area execution.

- Market Feeling: Financial backer opinion and market brain research assume a huge part in share cost developments. Positive feeling and hopefulness can drive share costs up, while pessimistic opinion and dread can prompt downfalls. Market news, tales, and market theory can vigorously impact opinion.

- Income Reports and News: Quarterly or yearly profit reports, as well as other critical news or declarations connected with an organization, can considerably affect its portion cost. Positive profit astonishments or significant improvements can bring about share cost appreciation, while frustrating outcomes or negative news can prompt downfalls.

- Market interest: The essential standards of market interest likewise apply to share costs. In the event that there is popularity for a stock and restricted supply, its cost is probably going to increment. On the other hand, assuming stockpile surpasses request, share costs might decline.

- Financial backer Discernment: Insights, assumptions, and opinions of individual and institutional financial backers about an organization or the general market can influence share costs. Factors like financial backer certainty, risk craving, and market patterns impact speculation choices and resulting share cost developments.

It's critical to take note of that these elements are interconnected, and the financial exchange is impacted by a perplexing interaction of different factors. Understanding these elements and directing exhaustive exploration can assist financial backers with pursuing more educated choices in the securities exchange.

Exploratory data analysis:

Statistical analysis of a stock price (TESLA):

For conducting this analysis we have chosen TESLA stock and we are considering 5 year of data. The main aim for this analysis is to check weather statistics can really help us to earn more money from stock market or is the reality totally different.
The first most step is to get data for analysis, so we are going to get help of library to get the stock price time series data
Data download:
Get to the stock data we are taking help of library called yfinance library so that we can download the time series data of the stock price.

Step-1 instal the library and the code for it is

```
In [1]: !pip install yfinance
```

Step-2 importing some libraries:

```
In [1]: import pandas as pd
        import yfinance
        import numpy as np
        from datetime import datetime
        import seaborn as sns
```

step-3 to get google price data for the years 2015 to 2023:

```
In [20]: ticker=yfinance.Ticker('TSLA')
         df_tesla=ticker.history(interval="1d",start="2015-03-15",end="2023-01-10")
```

```
In [4]: df_tesla.head()
```

Out[4]:

Date	Open	High	Low	Close	Volume	Dividends	Stock Splits
2015-03-16 00:00:00-04:00	12.800000	13.060667	12.653333	13.046667	84432000	0.0	0.0
2015-03-17 00:00:00-04:00	13.028667	13.247333	12.929333	12.982000	73411500	0.0	0.0
2015-03-18 00:00:00-04:00	12.997333	13.392000	12.874000	13.380667	72313500	0.0	0.0
2015-03-19 00:00:00-04:00	13.466667	13.639333	12.968667	13.043333	127128000	0.0	0.0
2015-03-20 00:00:00-04:00	13.163333	13.266000	13.041333	13.205333	64042500	0.0	0.0

Also getting information and describing the dataset using the following command:

```
In [11]: df_tesla.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 1970 entries, 2015-03-16 00:00:00-04:00 to 2023-01-09 00:00:00-05:00
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Open          1970 non-null   float64
 1   High          1970 non-null   float64
 2   Low           1970 non-null   float64
 3   Close         1970 non-null   float64
 4   Volume        1970 non-null   int64
 5   Dividends     1970 non-null   float64
 6   Stock Splits  1970 non-null   float64
 7   Return        1970 non-null   float64
dtypes: float64(7), int64(1)
memory usage: 138.5 KB
```

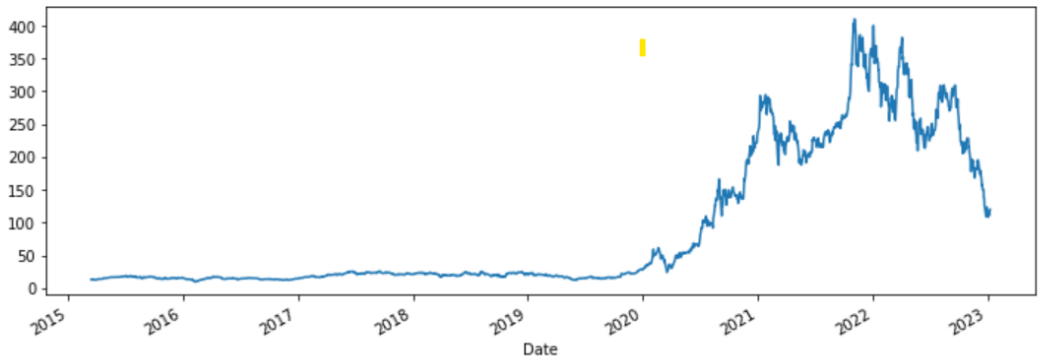
```
In [30]: df_tesla.describe()
```

Out[30]:

	Open	High	Low	Close	Volume	Dividends	Stock Splits	Return
count	1970.000000	1970.000000	1970.000000	1970.000000	1.970000e+03	1970.0	1970.000000	1970.000000
mean	90.671656	92.714042	88.407894	90.590252	1.124588e+08	0.0	0.004061	0.000349
std	109.274833	111.792447	106.417609	109.114029	8.089452e+07	0.0	0.131344	0.028878
min	9.488000	10.331333	9.403333	9.578000	1.062000e+07	0.0	0.000000	-0.127897
25%	16.508833	16.733334	16.322999	16.514333	6.399930e+07	0.0	0.000000	-0.015109
50%	22.177000	22.602334	21.801666	22.221666	8.843550e+07	0.0	0.000000	0.000028
75%	191.287498	195.849998	184.275002	190.890003	1.287326e+08	0.0	0.000000	0.015520
max	411.470001	414.496674	405.666656	409.970001	9.140820e+08	0.0	5.000000	0.157803

Plotting close price

```
In [6]: df_tesla['Close'].plot(figsize=(12,4))
Out[6]: <AxesSubplot:xlabel='Date'>
```



One can see by above plot that tesla has a slowdown in its closing price price between the period of 2022 and 2023.

Step-4 calculating daily returns

Return is the gain or loss that an investment generates over a period of time. A positive return indicates a profit while a negative return a loss.

For conducting any analysis on a stock we have to work with returns that the stock gave over a period of time but not with the price of the stock itself

So for calculation daily returns (the returns the stock gave from one day to the next day is called daily returns) we use a use a formula which is

$$r_i = \frac{P_i - P_{i-1}}{P_{i-1}}$$

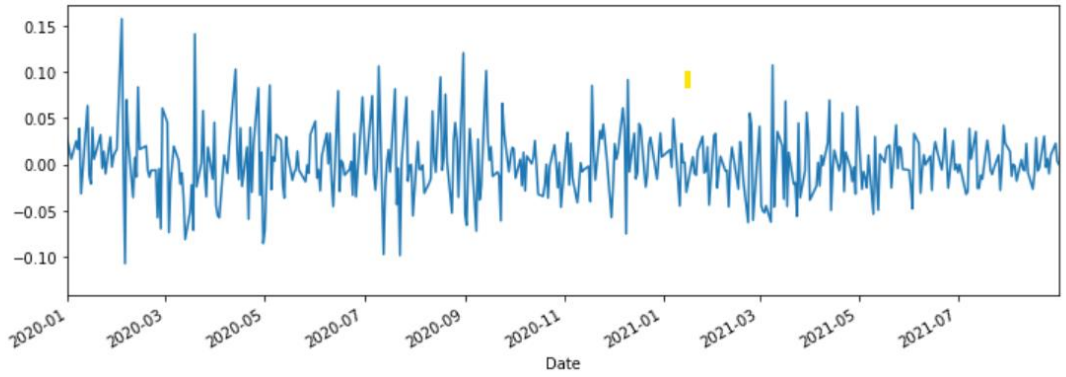
Pi is the current day closing and Pi-1 is current day opening price.

```
In [26]: df_tesla['Return']=(df_tesla['Close']-df_tesla['Open'])/df_tesla['Open']

In [27]: df_tesla['Return']
Out[27]: Date
         2015-03-16 00:00:00-04:00    0.019271
         2015-03-17 00:00:00-04:00   -0.003582
         2015-03-18 00:00:00-04:00    0.029493
         2015-03-19 00:00:00-04:00   -0.031436
         2015-03-20 00:00:00-04:00    0.003191
                                          ...
         2023-01-03 00:00:00-05:00   -0.087533
         2023-01-04 00:00:00-05:00    0.041518
         2023-01-05 00:00:00-05:00   -0.001538
         2023-01-06 00:00:00-05:00    0.097670
         2023-01-09 00:00:00-05:00    0.006809
         Name: Return, Length: 1970, dtype: float64
```

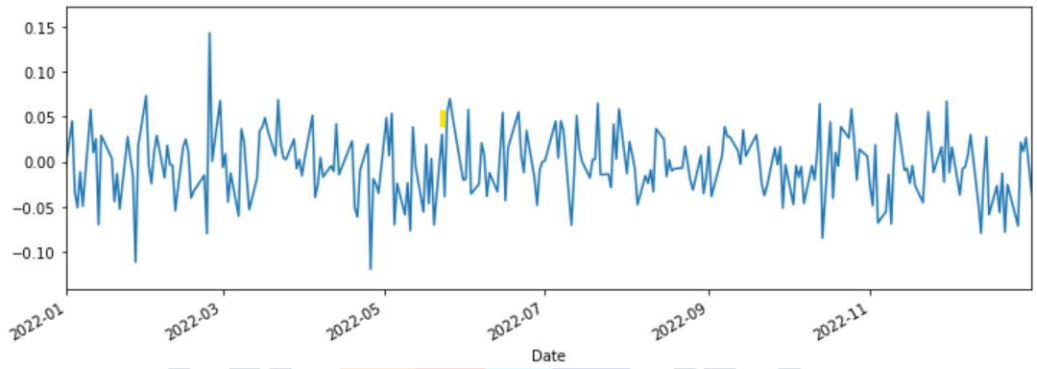
Plot "Return" from 2020 to 2021:

```
In [28]: ## xlimit and y limit
         df_tesla['Return'].plot(xlim=['2020-01-01','2021-09-01'],figsize=(12,4))
Out[28]: <AxesSubplot:xlabel='Date'>
```



Plot "Return" from 2022 to 2023:

```
In [29]: df_tesla['Return'].plot(xlim=['2022-01-01','2023-01-01'],figsize=(12,4))
Out[29]: <AxesSubplot:xlabel='Date'>
```



To calculate the means value and it code np.mean (df_tesla['Return']) and the mean value comes out

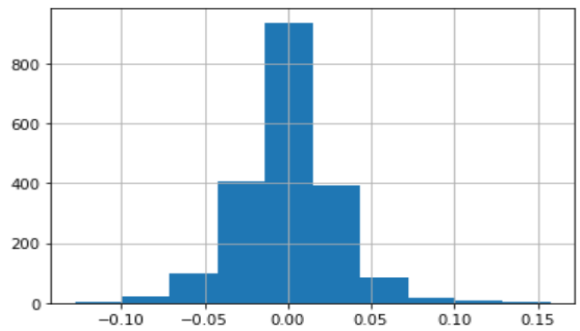
```
In [11]: np.mean(df_tesla['Return'])
Out[11]: 0.00034854913949467875
```

to be

The mean value is very close to zero but as it is positive value it clearly shows that there is a positive drift of the price time series.

Histogram:

```
In [13]: df_tesla['Return'].hist()
Out[13]: <AxesSubplot:>
```



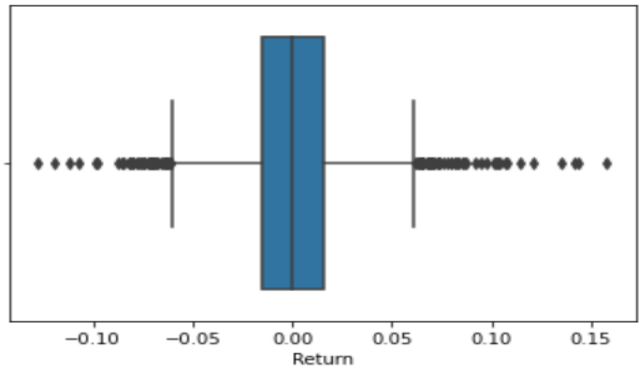
Here histogram signifies that most of the day one gets a zero % return. That is making no profit from tesla stocks.

Boxplot:

```
In [15]: sns.boxplot(df_tesla['Return'])
```

```
C:\Users\vipul pandit\anaconda3\lib\site-packages\seaborn
yword arg: x. From version 0.12, the only valid positiona
icit keyword will result in an error or misinterpretation
  warnings.warn(
```

```
Out[15]: <AxesSubplot:xlabel='Return'>
```



Here mean is zero so, we are making 0 % profit and also many outliers are present which means if someone buys tesla stocks, he will either makes lots of money or lose lots of money.

Stock Price prediction of TESLA using Machine learning algorithm:

In this section we have used linear regression algorithm of machine learning to predict the stock prices of tesla.

Building model for the tesla dataset:

```
In [10]: # Building the regression model
         from sklearn.model_selection import train_test_split

         #For preprocessing
         from sklearn.preprocessing import MinMaxScaler
         from sklearn.preprocessing import StandardScaler

         #For model evaluation
         from sklearn.metrics import mean_squared_error as mse
         from sklearn.metrics import r2_score
```

```
In [11]: #Split the data into train and test sets
         X = np.array(tesla.index).reshape(-1,1)
         Y = tesla['Close']
         X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.3, random_state=101)
```

We have split the dataset into training and testing dataset which will help us to predict the future stock prices of tesla.

Now, to process the model, we have used feature scaling on our dataset:

```
In [12]: # Feature scaling
         scaler = StandardScaler().fit(X_train)
```

```
In [13]: from sklearn.linear_model import LinearRegression
```

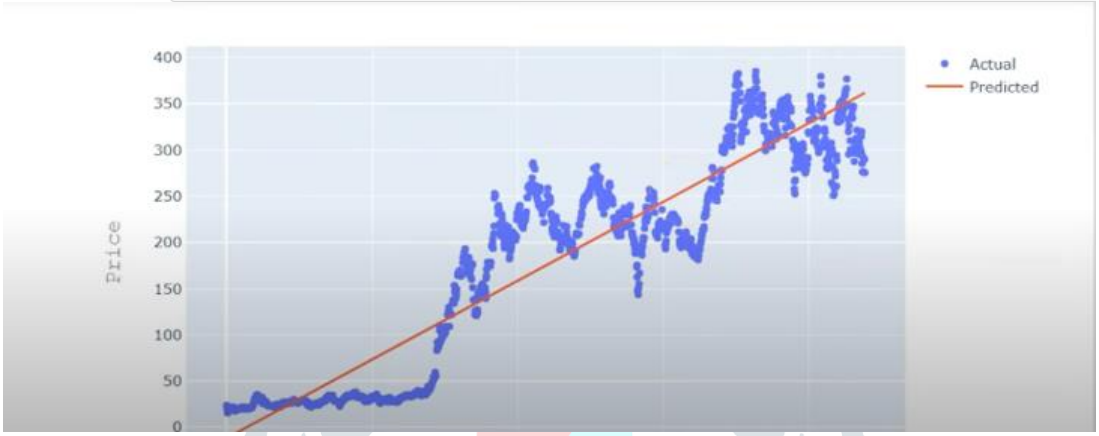
```
In [14]: #Creating a linear model
         lm = LinearRegression()
         lm.fit(X_train, Y_train)
```

```
Out[14]: LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

Plotting actual and predicted stock prices:

```
In [15]: #Plot actual and predicted values for train dataset
trace0 = go.Scatter(
    x = X_train.T[0],
    y = Y_train,
    mode = 'markers',
    name = 'Actual'
)
trace1 = go.Scatter(
    x = X_train.T[0],
    y = lm.predict(X_train).T,
    mode = 'lines',
    name = 'Predicted'
)
tesla_data = [trace0,trace1]
layout.xaxis.title.text = 'Day'
plot2 = go.Figure(data=tesla_data, layout=layout)

In [16]: iplot(plot2)
```



Checking for accuracy using R-square and MSE:

```
In [17]: #Calculate scores for model evaluation
scores = f'''
{'Metric'.ljust(10)}{'Train'.center(20)}{'Test'.center(20)}
{'r2_score'.ljust(10)}{r2_score(Y_train, lm.predict(X_train))}\t{r2_score(Y_test, lm.predict(X_test))}
{'MSE'.ljust(10)}{mse(Y_train, lm.predict(X_train))}\t{mse(Y_test, lm.predict(X_test))}
'''
print(scores)
```

```
Metric          Train               Test
r2_score  0.8658871776828707    0.8610649253244574
MSE       1821.3833862936174    1780.987539418845
```

we got accuracy around 0.86 which shows that our model is giving a better accuracy.

Conclusion

In conclusion, the project "Stock Market Analysis Using Statistical Techniques" aimed to apply statistical methods to analyse and gain insights into the stock market. Through the utilization of various statistical techniques, including but not limited to regression analysis, time series analysis, and correlation analysis, we have been able to extract valuable information from historical stock data.

The analysis revealed several important findings. Firstly, statistical techniques allowed us to identify trends and patterns in stock price movements, providing us with a better understanding of the market dynamics. We were able to identify factors that influence stock prices, such as company performance, economic indicators, and market sentiment.

Moreover, statistical analysis helped us in making predictions and forecasting future stock prices. By analyzing historical data and applying forecasting models, we gained insights into potential future price movements, allowing investors to make more informed decisions.

Furthermore, statistical techniques enabled us to assess the risk and return associated with different stocks or portfolios. Through measures such as standard deviation, beta, and Sharpe ratio, we were able to quantify the risk and evaluate the performance of investments, assisting investors in managing their portfolios effectively.

Overall, the application of statistical techniques in stock market analysis proved to be highly valuable. It provided us with a systematic and data-driven approach to understand market behavior, identify investment opportunities, and manage risk. However, it is essential to note that no analysis or technique can guarantee accurate predictions or eliminate the inherent risks associated with stock market investing.

In conclusion, the project demonstrated the significance of statistical techniques in analyzing the stock market. The findings and insights gained from this analysis can aid investors, traders, and financial professionals in making more informed decisions and developing effective investment strategies.

References

[1]https://www.stocklinedirect.com/stocks-in-uptrend.html

[2]https://en.wikipedia.org/wiki/Stock_market

[3] Senthamarai K K; Sekar S P; Sathik M M Arumugam P; IMECS 2010. CAST: Financial Stock Market Forecast using Data Mining Techniques. International multi-conference of engineers and computer scientists Vol 1/.

[4] Reddy, S. (2010). Prediction of Stock Market Indices – Using SAS.

[5] Powell, N. (2011). Supervised and Unsupervised Methods for Stock Trend Forecasting.