EX:No.2 DATE:15/02/25	**Implement programs for visualizing time series data**

AIM:

To analyze and visualize stock trends using time series plots, moving averages, volume analysis, and daily returns.

ALGORITHM:

1. Load Data – Import libraries and read the AAPL stock dataset.
2. Preprocess – Convert 'Date' to datetime, sort, and set it as the index.
3. Handle Missing Values – Check and fill missing values using forward-fill.
4. Plot Closing Price – Visualize AAPL's 'Close' price over time.
5. Moving Averages – Compute and plot 7-day & 50-day moving averages.
6. Volume Analysis – Plot cumulative and daily traded volume trends.
7. Daily Returns – Calculate and visualize percentage price changes.

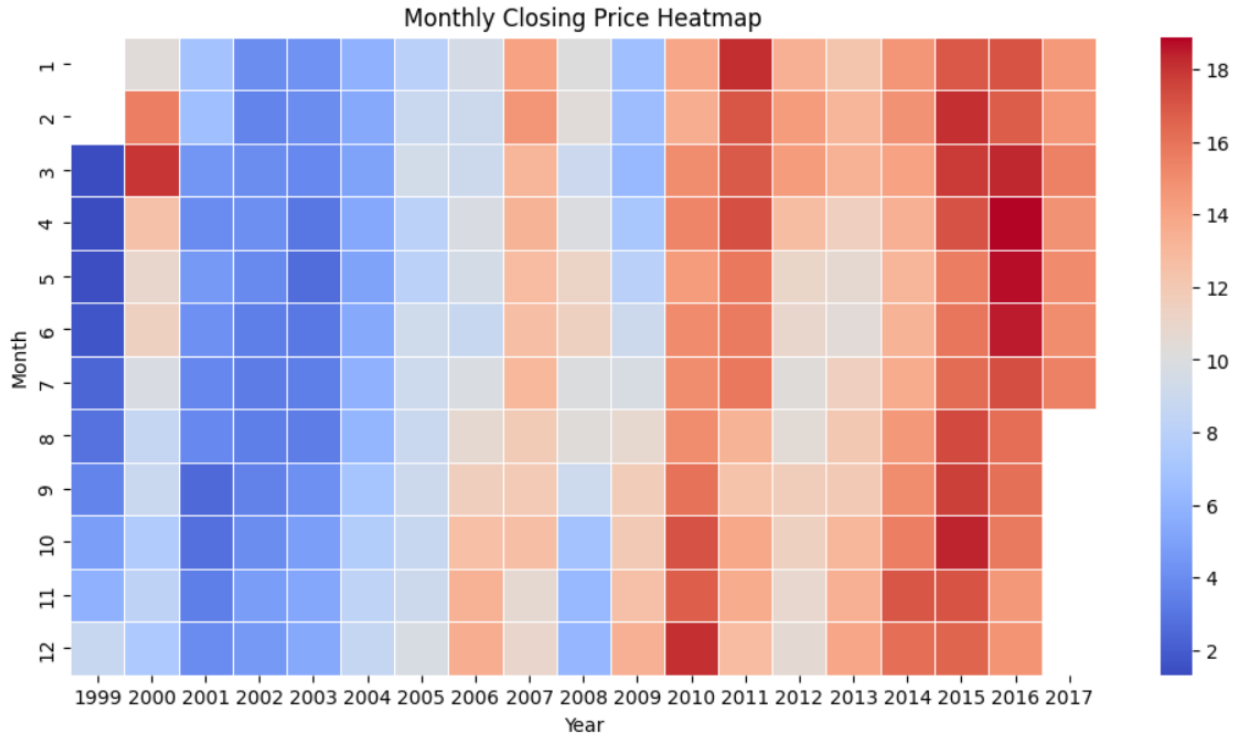
CODE:

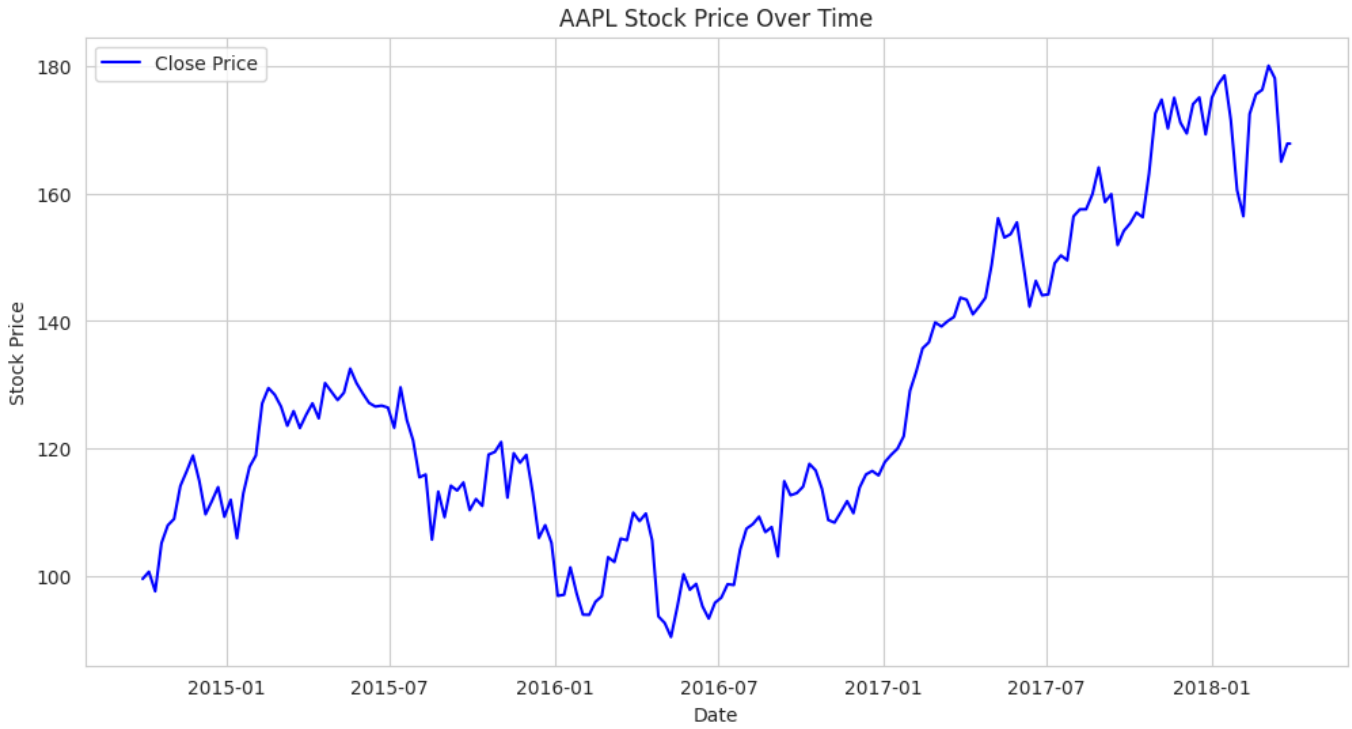
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
file_path = 'AAPL.csv'  # Replace with the path to your dataset
data = pd.read_csv('/content/AAPL.csv')
print("First few rows of the dataset:")
print(data.head())
if 'Date' in data.columns:
    data['Date'] = pd.to_datetime(data['Date'])
    data = data.sort_values(by='Date')
else:
    raise ValueError("The dataset must have a 'Date' column.")
data.set_index('Date', inplace=True)
print("\nChecking for missing values:")
print(data.isnull().sum())
```

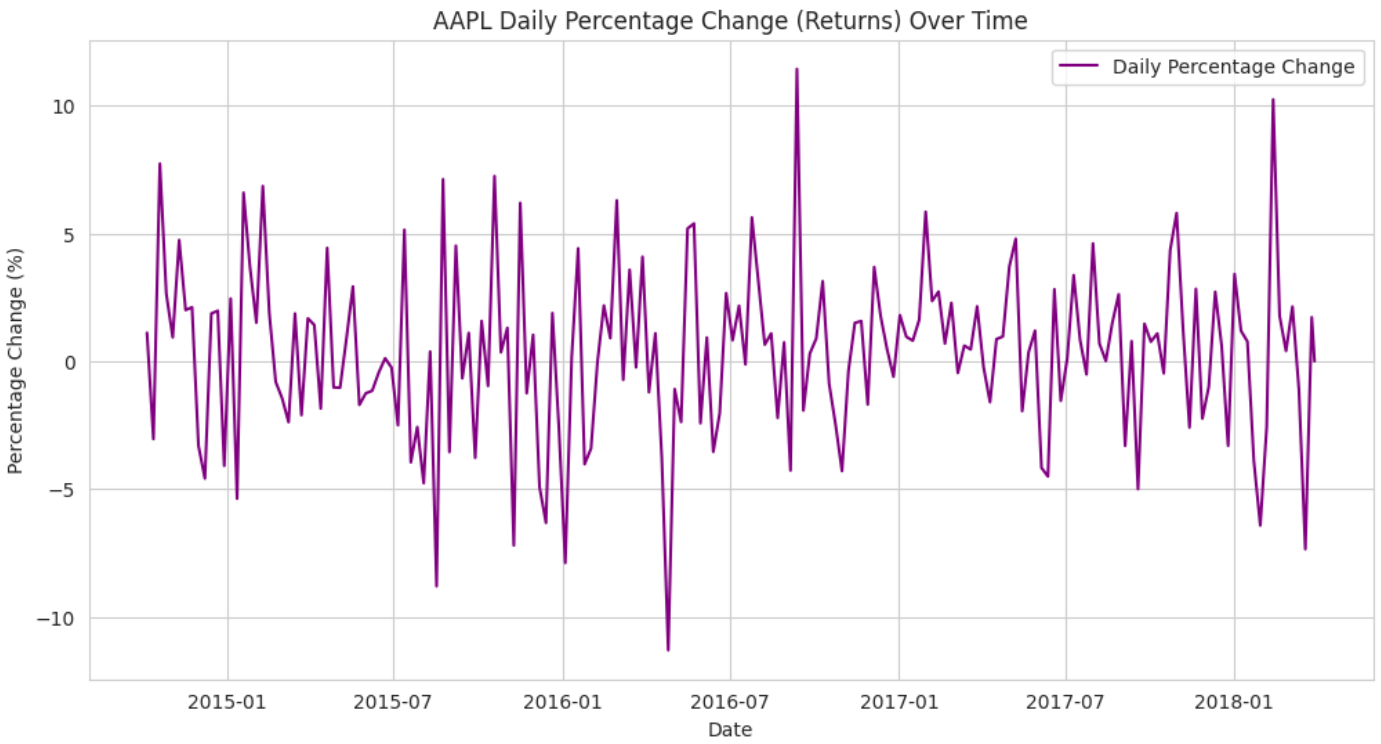
```
data.fillna(method='ffill', inplace=True)
plt.figure(figsize=(12, 6))
sns.set_style('whitegrid')
if 'Close' in data.columns:
    plt.plot(data.index, data['Close'], label='Close Price', color='blue')
    plt.title('AAPL Stock Price Over Time')
    plt.xlabel('Date')
    plt.ylabel('Stock Price')
    plt.legend()
    plt.show()
else:
    raise ValueError("The dataset must have a 'Close' column for stock prices.")
data['MA_50'] = data['Close'].rolling(window=50).mean()  # 50-day Moving Average

plt.figure(figsize=(12, 6))
plt.plot(data.index, data['Close'], label='Close Price', color='blue', alpha=0.5)
plt.plot(data.index, data['MA_50'], label='50-Day MA', color='orange', linewidth=2)
plt.title('AAPL Stock Price with 50-Day Moving Average')
plt.xlabel('Date')
plt.ylabel('Stock Price')
plt.legend()
plt.show()
data['Cumulative_Volume'] = data['Volume'].cumsum()

plt.figure(figsize=(12, 6))
plt.plot(data.index, data['Cumulative_Volume'], label='Cumulative Volume', color='darkgreen')
plt.title('AAPL Cumulative Volume Traded Over Time')
plt.xlabel('Date')
plt.ylabel('Cumulative Volume')
plt.legend()
plt.show()
plt.figure(figsize=(12, 6))
plt.plot(data.index, data['Close'], label='Close Price', color='blue', alpha=0.5)
```

```
plt.plot(data.index, data['MA_7'], label='7-Day MA', color='red', linewidth=2)
plt.plot(data.index, data['MA_50'], label='50-Day MA', color='orange', linewidth=2)
plt.title('AAPL Stock Price with 7-Day and 50-Day Moving Averages')
plt.xlabel('Date')
plt.ylabel('Stock Price')
plt.legend()
plt.show()
data['Daily_Return'] = data['Close'].pct_change() * 100
plt.figure(figsize=(12, 6))
plt.plot(data.index, data['Daily_Return'], label='Daily Percentage Change', color='purple')
plt.title('AAPL Daily Percentage Change (Returns) Over Time')
plt.xlabel('Date')
plt.ylabel('Percentage Change (%)')
plt.legend()
plt.show()
plt.figure(figsize=(12, 6))
plt.bar(data.index, data['Volume'], color='lightcoral')
plt.title('AAPL Volume Traded Over Time')
plt.xlabel('Date')
plt.ylabel('Volume')
plt.xticks(rotation=45)
plt.show()
```

OUTPUT:


Monthly Closing Price Heatmap
Month
Year
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
1 2 3 4 5 6 7 8 9 10 11 12
18 16 14 12 10 8 6 4 2


AAPL Stock Price Over Time
Close Price
Stock Price
Date
180 160 140 120 100
2015-01 2015-07 2016-01 2016-07 2017-01 2017-07 2018-01


AAPL Daily Percentage Change (Returns) Over Time
Daily Percentage Change
Percentage Change (%)
10
5
0
−5
−10
2015-01
2015-07
2016-01
2016-07
2017-01
2017-07
2018-01
Date


Closing Price Distribution
Closing Price (USD)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5

RESULT:

Thus the program has been completed and verified successfully.