In [30]:

```
#Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Load the dataset
stock_data = "/kaggle/input/stockdata/stock_data.csv"
data = pd.read_csv(stock_data)

# Display the first few rows to understand the structure of the dataset
data.head()

```

Out[30]:

	Date	Ticker	Adj Close	Close	High	Low	
0	2023-07-03	HDFCBANK.NS	1696.631836	1719.800049	1757.500000	1710.000000	1712.50
1	2023-07-03	INFY.NS	1309.278564	1333.699951	1346.000000	1328.449951	1330.00
2	2023-07-03	RELIANCE.NS	2405.791992	2414.290283	2420.105225	2358.587158	2361.07
3	2023-07-03	TCS.NS	3216.993164	3272.300049	3318.800049	3268.750000	3314.30
4	2023-07-04	HDFCBANK.NS	1704.918579	1728.199951	1747.000000	1713.800049	1723.44

The dataset contains stock data with the following columns:

Date: The trading date. Ticker: Stock symbol (e.g., HDFCBANK.NS, INFY.NS). Adj Close: Adjusted closing price (accounts for splits, dividends). Close: The raw closing price of the stock on the given day. High: The highest price during the trading day. Low: The lowest price during the trading day. Open: The opening price of the stock. Volume: Number of shares traded.

In [31]:

```
# Check for missing values and data types
missing_values = data.isnull().sum()
data_types = data.dtypes

missing_values, data_types
```

Out[31]:

```
(Date         0
Ticker       0
Adj Close    0
Close        0
High         0
Low          0
Open         0
Volume       0
dtype: int64,
Date          object
Ticker        object
Adj Close    float64
Close        float64
High         float64
Low          float64
Open         float64
Volume       float64
dtype: object)
```

The dataset has no missing values, which is a good starting point for analysis. The data types of the columns are as follows:

Date: Object (should be converted to datetime for time-series analysis). Ticker: Object (categorical, representing stock symbols). Adj Close, Close, High, Low, Open: Float64 (numerical data).

In [12]:

```
# Convert 'Date' to datetime format
data['Date'] = pd.to_datetime(data['Date'])

# Generate basic descriptive statistics for numerical columns
descriptive_stats = data.describe()

descriptive_stats
```

Out[12]:

	Date	Adj Close	Close	High	Low	Open	
count	972	972.000000	972.000000	972.000000	972.000000	972.000000	9.7
mean	2023-12-28 15:06:40	2331.144987	2348.198490	2367.756148	2328.416296	2347.487891	9.1
min	2023-07-03 00:00:00	1304.812012	1329.150024	1341.900024	1305.000000	1320.199951	7.7
25%	2023-09-27 00:00:00	1487.235016	1501.674988	1517.037506	1489.187500	1504.074982	3.3
50%	2023-12-28 00:00:00	1973.128723	1977.974976	2007.750000	1967.050049	1984.500000	5.8
75%	2024-03-28 00:00:00	3149.300598	3163.075012	3193.787476	3109.062561	3116.775024	1.1
max	2024-06-28 00:00:00	4188.805176	4219.250000	4254.750000	4177.000000	4215.250000	8.6
std	NaN	922.665514	927.894765	936.526731	919.210077	927.290255	9.8

The descriptive statistics of the dataset reveal the following:

Stock Prices (Adj Close, Close, High, Low, Open):

The average adjusted closing price is approximately 2,331.14, with values ranging from 1,304.81 to 4,188.81. Stock prices show variability with a standard deviation of around 922.67. The median (50th percentile) adjusted closing price is 1,973.13, suggesting a distribution skewed slightly towards higher prices. Volume:

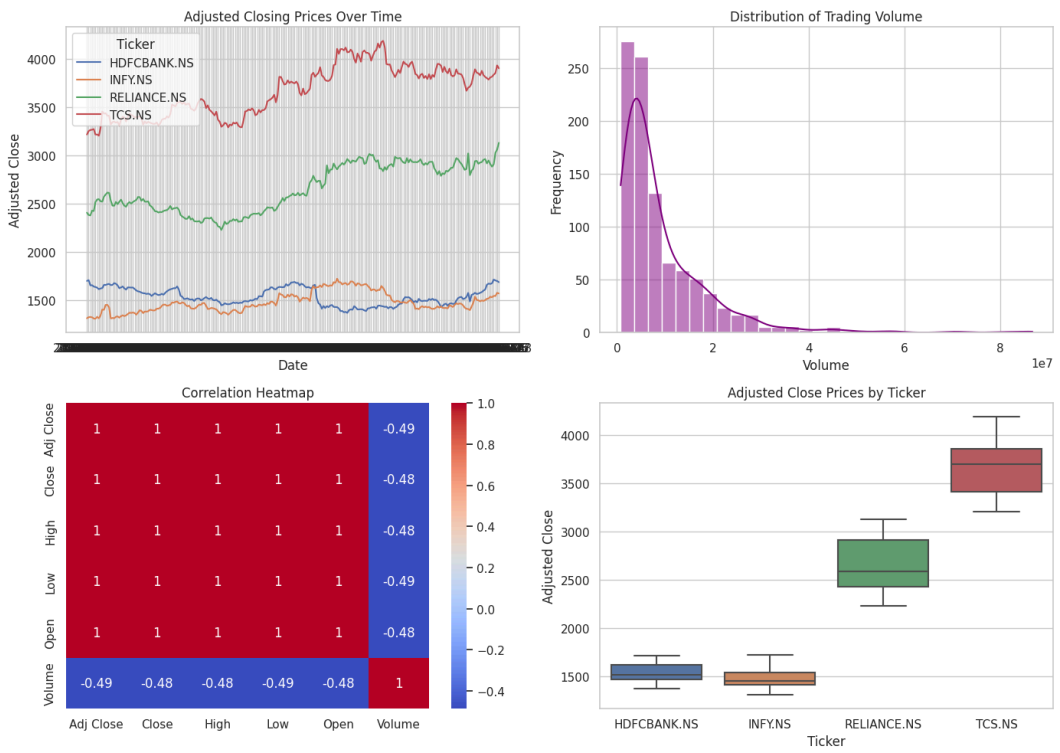
The average trading volume is approximately 9.20 million shares, with significant variability (standard deviation: 9.90 million). The trading volume ranges from about 772,291 to 86.71 million shares, indicating that some stocks are traded more actively than others.

In [32]:

```
# Replace infinte values with NaN because of warnings
data.replace([np.inf, -np.inf], np.nan, inplace=True)
```

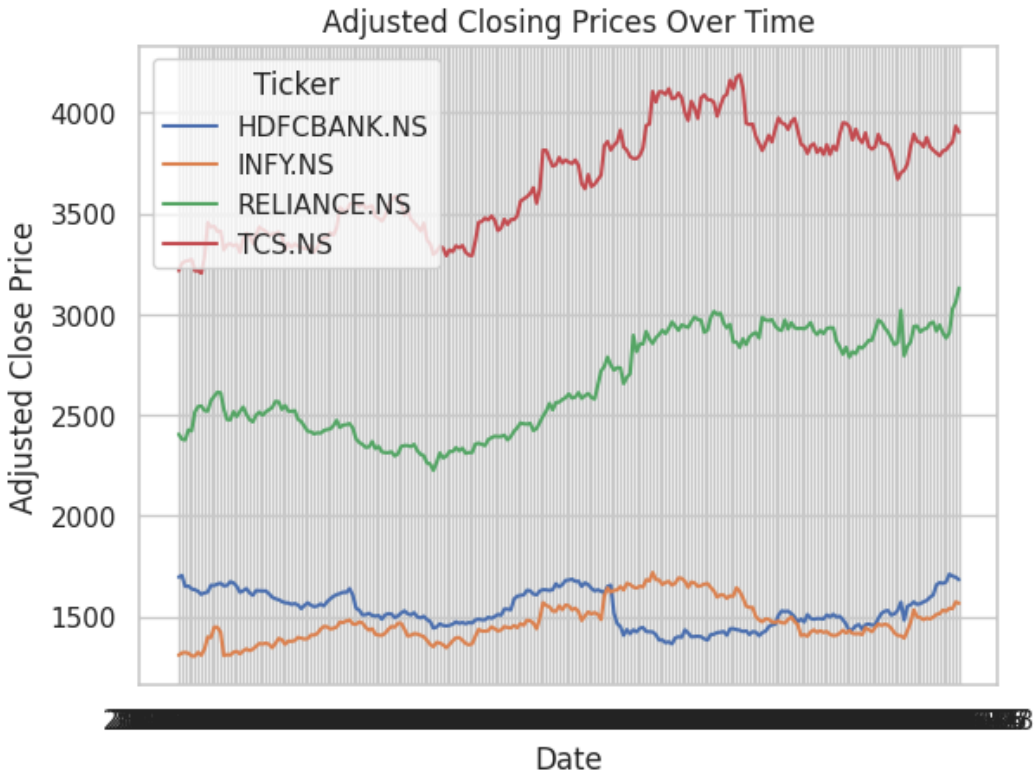
In [33]:

```
# Set plot style for better visuals
sns.set(style="whitegrid")

# Create a figure for subplots
fig, axes = plt.subplots(2, 2, figsize=(14, 10))

# Plotting the adjusted closing prices over time for all stocks
sns.lineplot(data=data, x='Date', y='Adj Close', hue='Ticker', ax=axes[0, 0])
axes[0, 0].set_title('Adjusted Closing Prices Over Time')
axes[0, 0].set_xlabel('Date')
axes[0, 0].set_ylabel('Adjusted Close')

# Plotting distribution of trading volumes
sns.histplot(data['Volume'], bins=30, kde=True, ax=axes[0, 1], color='purple'
axes[0, 1].set_title('Distribution of Trading Volume')
axes[0, 1].set_xlabel('Volume')
axes[0, 1].set_ylabel('Frequency')

# Correlation heatmap for numerical variables
corr = data[['Adj Close', 'Close', 'High', 'Low', 'Open', 'Volume']].corr()
sns.heatmap(corr, annot=True, cmap='coolwarm', ax=axes[1, 0])
axes[1, 0].set_title('Correlation Heatmap')

# Boxplot for stock prices to identify potential outliers
sns.boxplot(data=data, x='Ticker', y='Adj Close', ax=axes[1, 1])
axes[1, 1].set_title('Adjusted Close Prices by Ticker')
axes[1, 1].set_xlabel('Ticker')
axes[1, 1].set_ylabel('Adjusted Close')

plt.tight_layout()
plt.show()
```



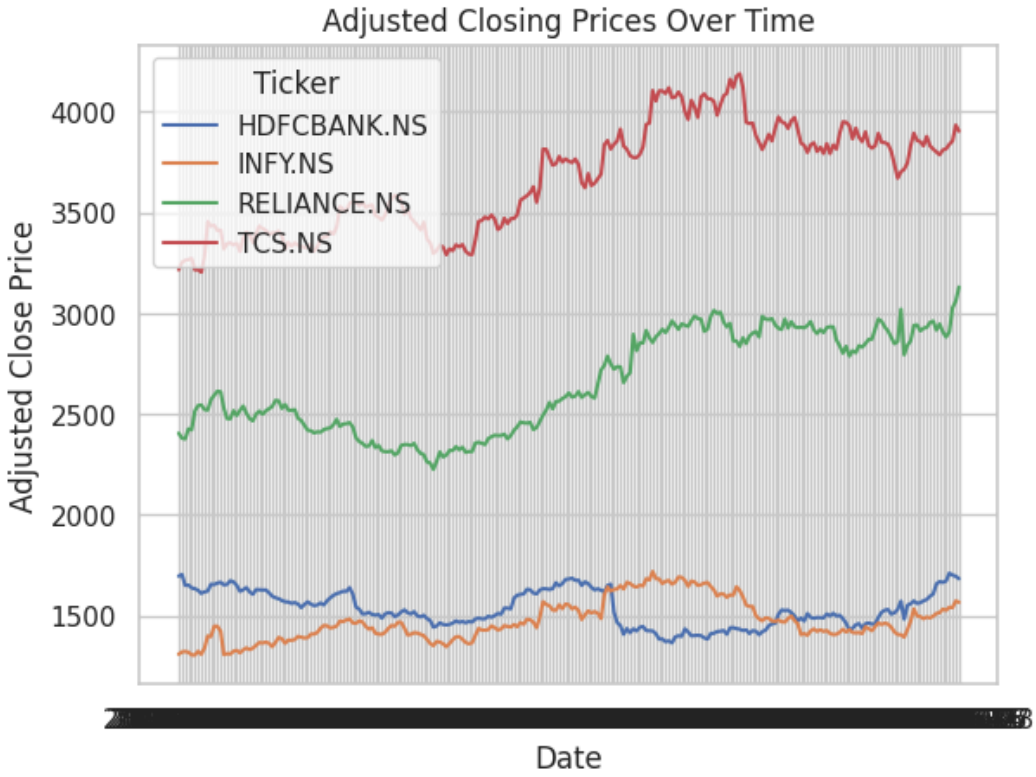
In [34]:

```
import warnings

# Suppress FutureWarning
warnings.simplefilter(action='ignore', category=FutureWarning)

# Replace infinite values with NaN
data.replace([float('inf'), float('-inf')], pd.NA, inplace=True)

# Plot Adjusted Close prices over time
sns.lineplot(data=data, x='Date', y='Adj Close', hue='Ticker')
plt.title('Adjusted Closing Prices Over Time')
plt.xlabel('Date')
plt.ylabel('Adjusted Close Price')
plt.show()

```



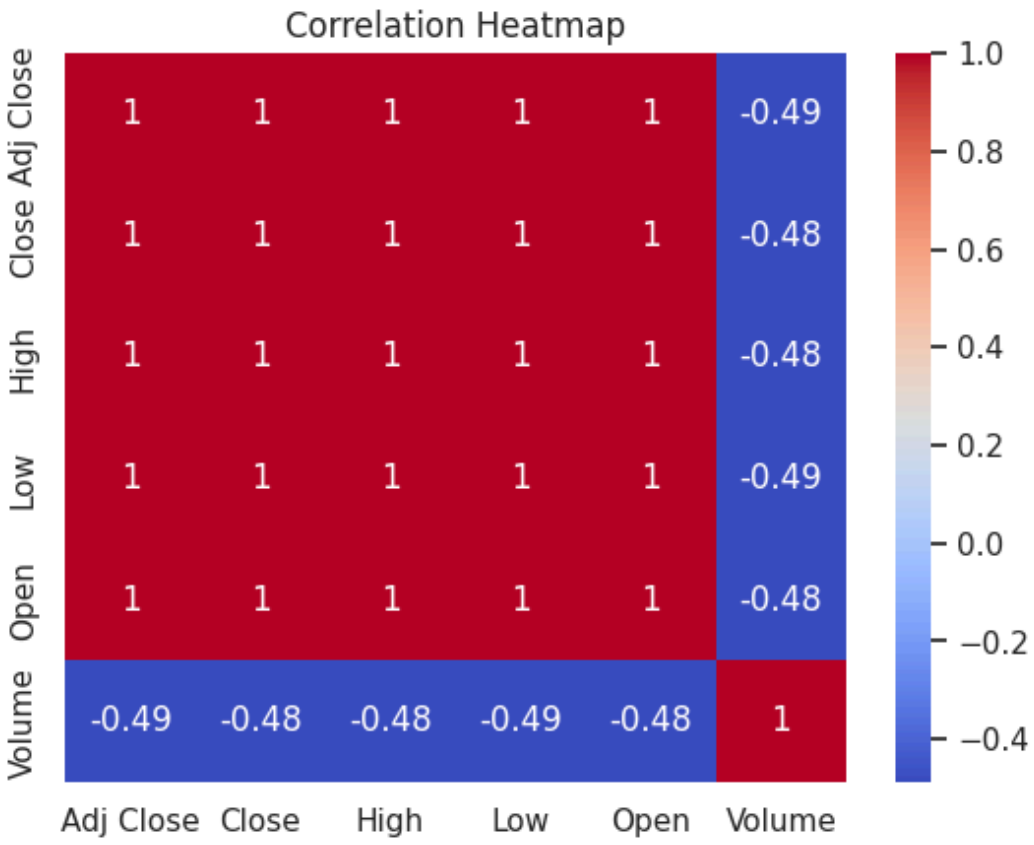
In [35]:

```
# Plot Adjusted Close prices over time
sns.lineplot(data=data, x='Date', y='Adj Close', hue='Ticker')
plt.title('Adjusted Closing Prices Over Time')
plt.xlabel('Date')
plt.ylabel('Adjusted Close Price')
plt.show()
```



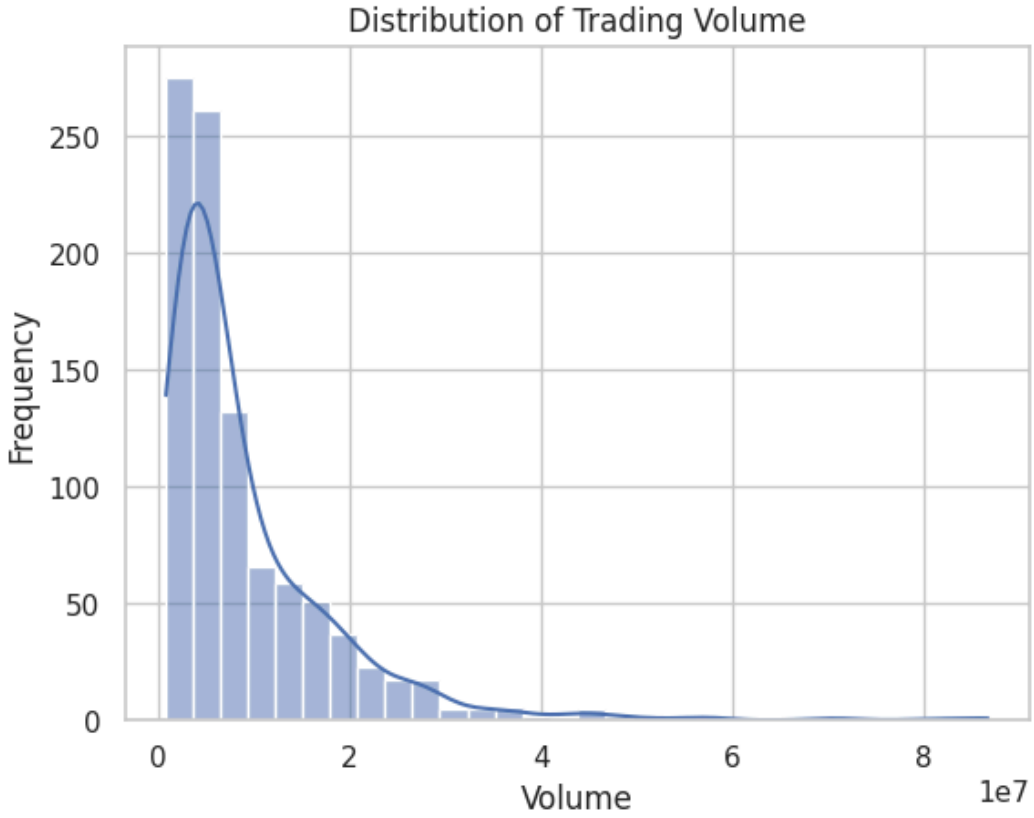
In [36]:

```
corr = data[['Adj Close', 'Close', 'High', 'Low', 'Open', 'Volume']].corr()
sns.heatmap(corr, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()

```



In [37]:

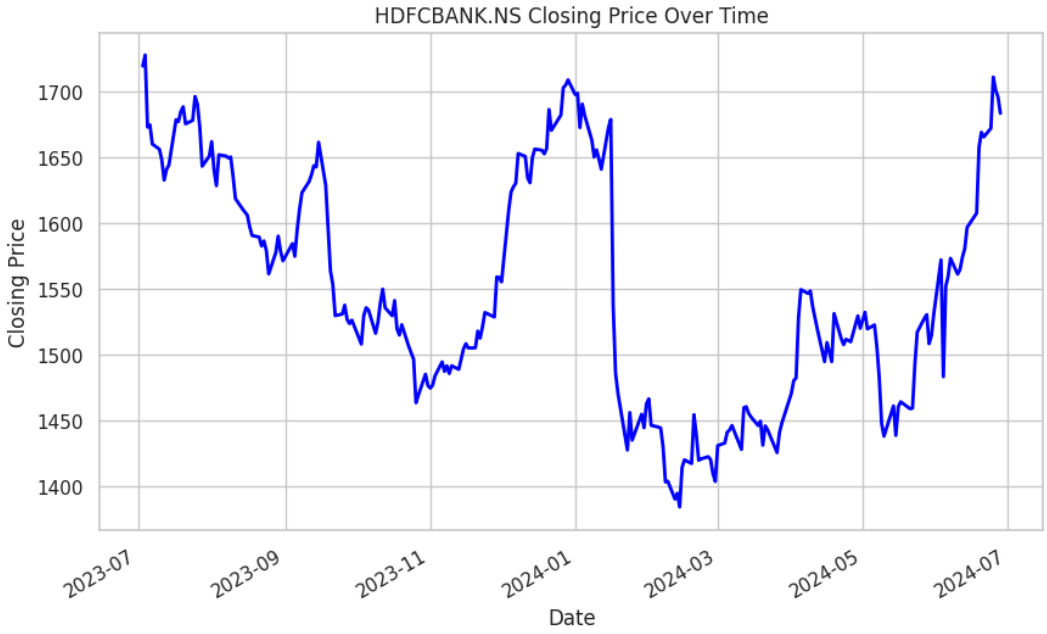
```
sns.histplot(data['Volume'], bins=30, kde=True)
plt.title('Distribution of Trading Volume')
plt.xlabel('Volume')
plt.ylabel('Frequency')
plt.show()

```

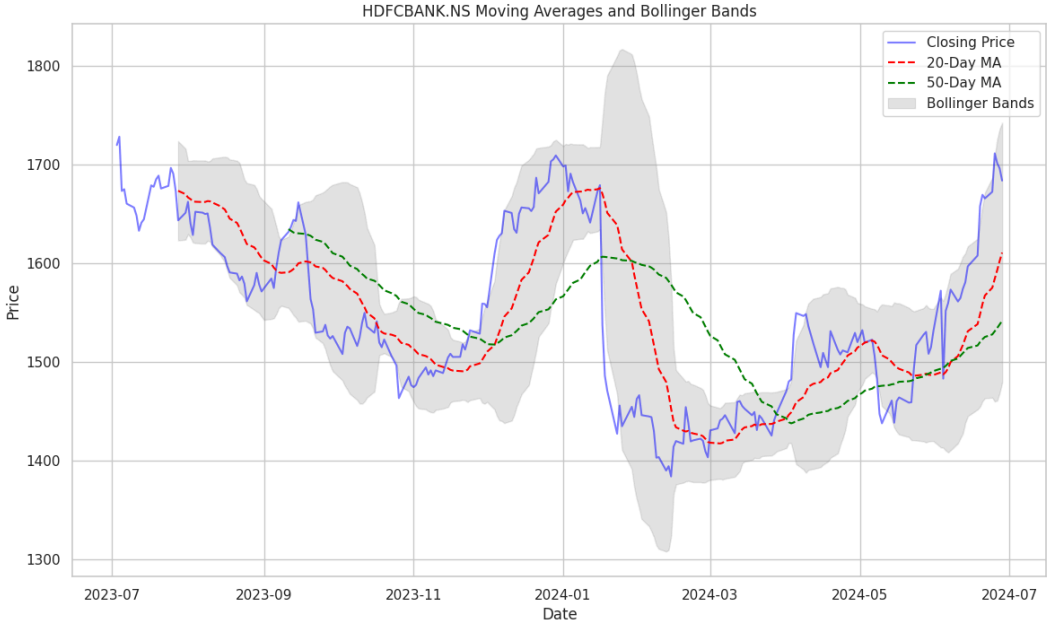


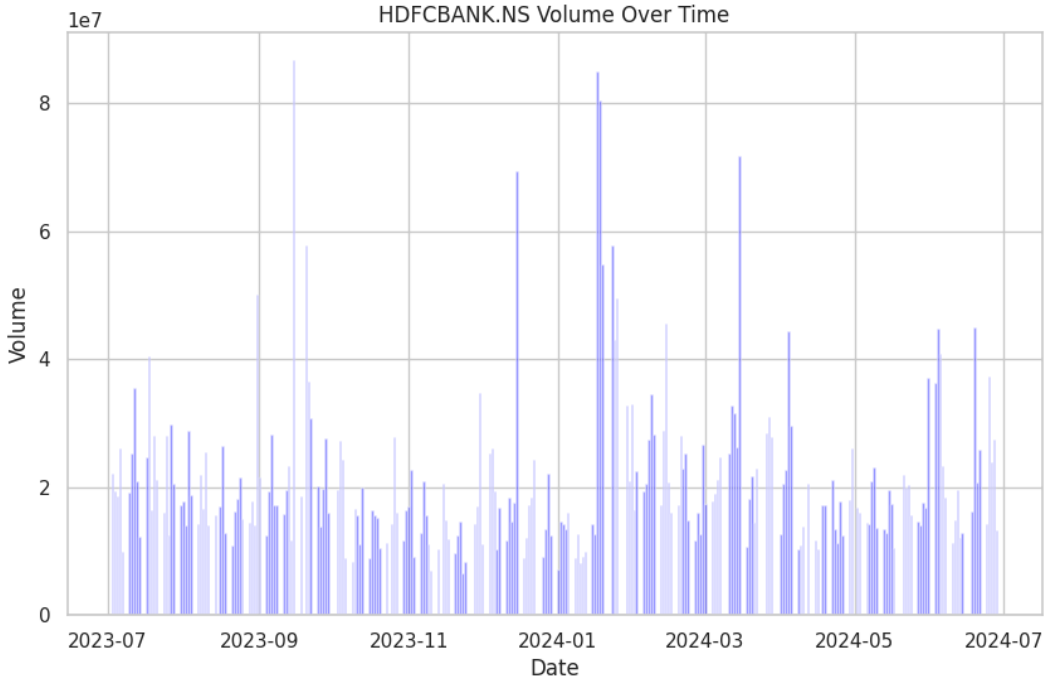
HDFC BANK STOCK

In [38]:

```
# Filter data for the HDFC Bank stock
hdfcbank_data = data[data['Ticker'] == 'HDFCBANK.NS'].copy()

# Convert 'Date' column to datetime format and set it as index
hdfcbank_data['Date'] = pd.to_datetime(hdfcbank_data['Date'])
hdfcbank_data.set_index('Date', inplace=True)

# Plot the closing price over time
plt.figure(figsize=(10, 6))
hdfcbank_data['Close'].plot(title='HDFCBANK.NS Closing Price Over Time',
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.grid(True)
plt.show()

# Calculate Moving Averages (20-day and 50-day)
hdfcbank_data['MA20'] = hdfcbank_data['Close'].rolling(window=20).mea
hdfcbank_data['MA50'] = hdfcbank_data['Close'].rolling(window=50).mea

# Calculate Bollinger Bands
hdfcbank_data['BB_Middle'] = hdfcbank_data['MA20']  # Middle Bollinger
hdfcbank_data['BB_Upper'] = hdfcbank_data['BB_Middle'] + (2 * hdfcbank
hdfcbank_data['BB_Lower'] = hdfcbank_data['BB_Middle'] - (2 * hdfcbank

# Plot Moving Averages and Bollinger Bands
plt.figure(figsize=(14, 8))
plt.plot(hdfcbank_data['Close'], label='Closing Price', color='blue', alpha=0
plt.plot(hdfcbank_data['MA20'], label='20-Day MA', color='red', linestyle='--
plt.plot(hdfcbank_data['MA50'], label='50-Day MA', color='green', linestyle

# Fill Bollinger Bands
plt.fill_between(hdfcbank_data.index, hdfcbank_data['BB_Upper'], hdfcb

plt.title('HDFCBANK.NS Moving Averages and Bollinger Bands')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend(loc='best')
plt.grid(True)
plt.show()

# Volume Analysis
plt.figure(figsize=(10, 6))
plt.bar(hdfcbank_data.index, hdfcbank_data['Volume'], color='blue', alph
plt.title('HDFCBANK.NS Volume Over Time')
plt.xlabel('Date')
plt.ylabel('Volume')
plt.grid(True)
plt.show()

```

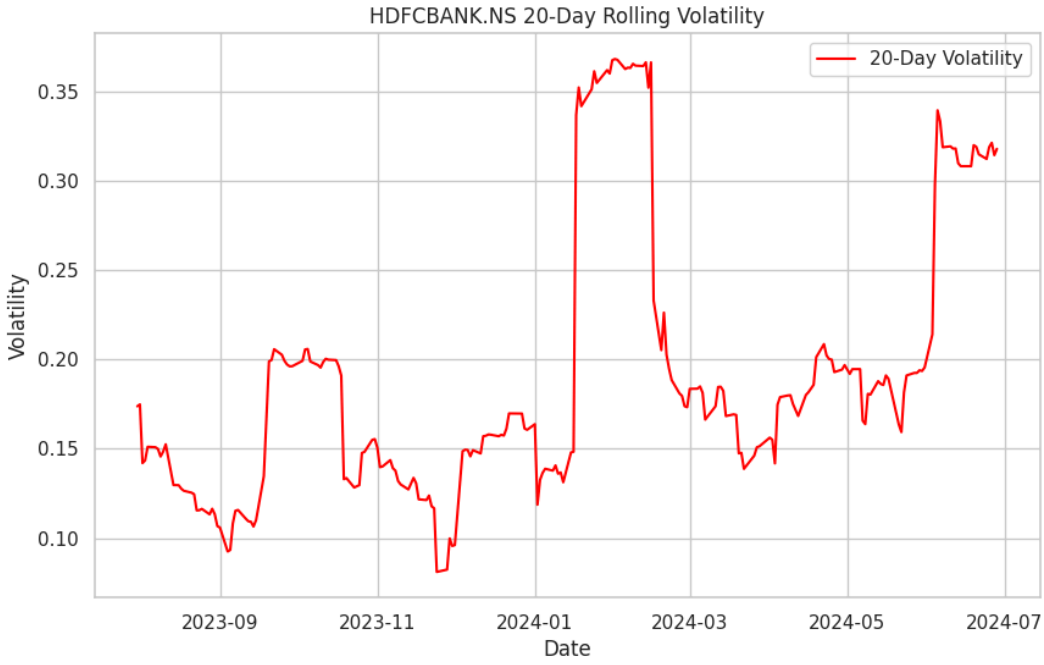

HDFCBANK.NS Closing Price Over Time
Closing Price
1700
1650
1600
1550
1500
1450
1400
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


HDFCBANK.NS Moving Averages and Bollinger Bands
Closing Price
20-Day MA
50-Day MA
Bollinger Bands
Price
1800
1700
1600
1500
1400
1300
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


HDFCBANK.NS Volume Over Time
1e7
Volume
8
6
4
2
0
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date

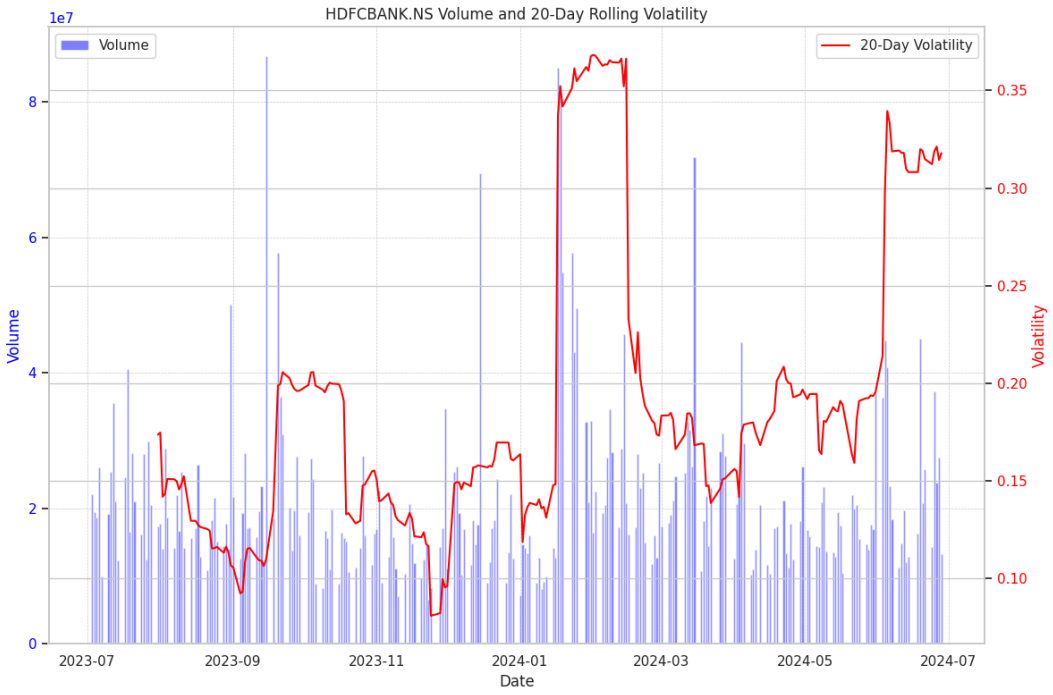
In [39]:

```
# Calculate daily returns for HDFC Bank
hdfcbank_data['Returns'] = hdfcbank_data['Close'].pct_change()

# Calculate rolling volatility (e.g., 20-day standard deviation of returns)
hdfcbank_data['Volatility'] = hdfcbank_data['Returns'].rolling(window=20).

# Plot the Volatility
plt.figure(figsize=(10, 6))

#plt.plot(hdfcbank_data['Close'], label='Closing Price', color='blue', alpha=
plt.plot(hdfcbank_data.index, hdfcbank_data['Volatility'], color='red', labe
plt.title('HDFCBANK.NS 20-Day Rolling Volatility')
plt.xlabel('Date')
plt.ylabel('Volatility')
plt.grid(True)
plt.legend()
plt.show()

```



In [40]:

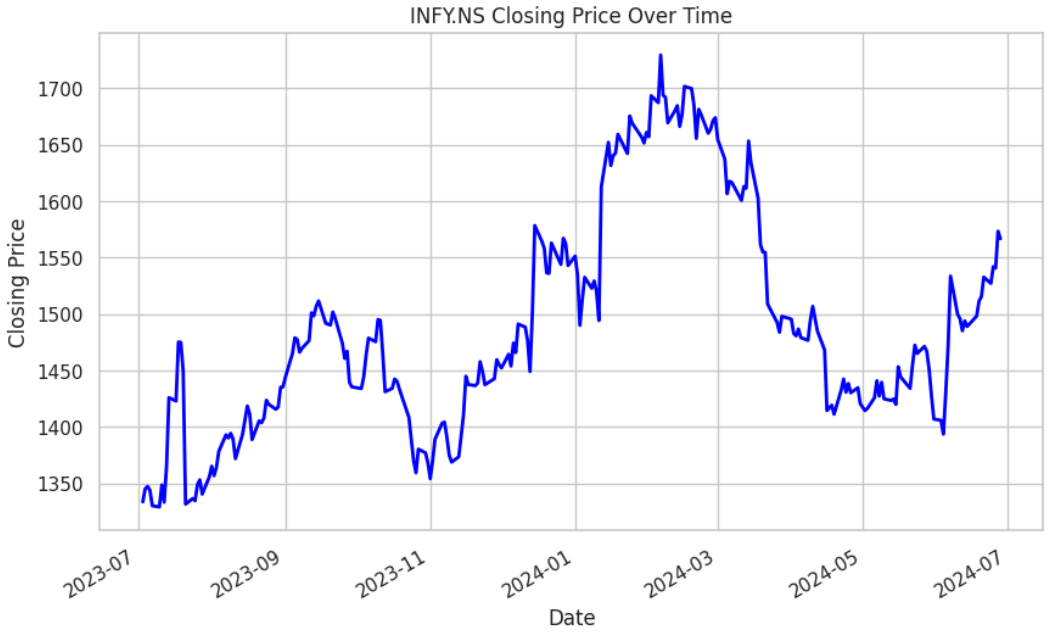
```
# Calculate daily returns for HDFC Bank
hdfcbank_data['Returns'] = hdfcbank_data['Close'].pct_change()

# Calculate rolling volatility (e.g., 20-day standard deviation of returns)
hdfcbank_data['Volatility'] = hdfcbank_data['Returns'].rolling(window=20).

# Create the figure and primary axis
fig, ax1 = plt.subplots(figsize=(12, 8))

# Plot Volume on the primary y-axis
ax1.bar(hdfcbank_data.index, hdfcbank_data['Volume'], color='blue', alp
ax1.set_xlabel('Date')
ax1.set_ylabel('Volume', color='blue')
ax1.tick_params(axis='y', labelcolor='blue')
ax1.grid(True, which='both', linestyle='--', linewidth=0.5)

# Create a secondary y-axis to plot the Volatility
ax2 = ax1.twinx()
ax2.plot(hdfcbank_data.index, hdfcbank_data['Volatility'], color='red', lab
ax2.set_ylabel('Volatility', color='red')
ax2.tick_params(axis='y', labelcolor='red')

# Titles and legends
plt.title('HDFCBANK.NS Volume and 20-Day Rolling Volatility')
fig.tight_layout()
ax1.legend(loc='upper left')
ax2.legend(loc='upper right')

plt.show()

```



INFOSYS STOCK

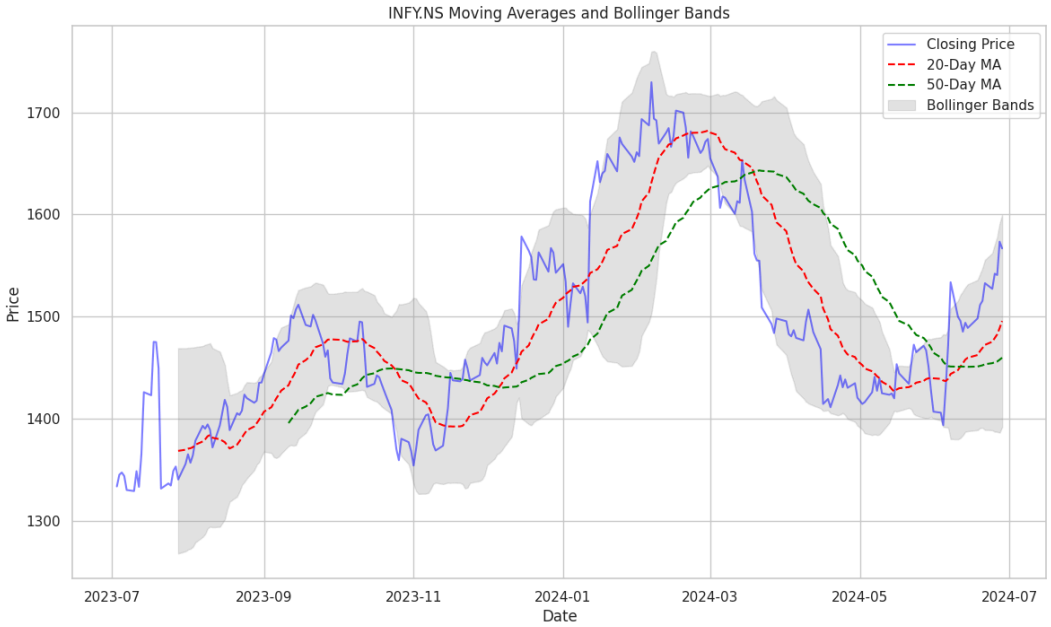
In [41]:

```
# Filter data for the Infosys stock
infosys_data = data[data['Ticker'] == 'INFY.NS'].copy()

# Convert 'Date' column to datetime format and set it as index
infosys_data['Date'] = pd.to_datetime(infosys_data['Date'])
infosys_data.set_index('Date', inplace=True)

# Plot the closing price over time
plt.figure(figsize=(10, 6))
infosys_data['Close'].plot(title='INFY.NS Closing Price Over Time', color='blue
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.grid(True)
plt.show()

```



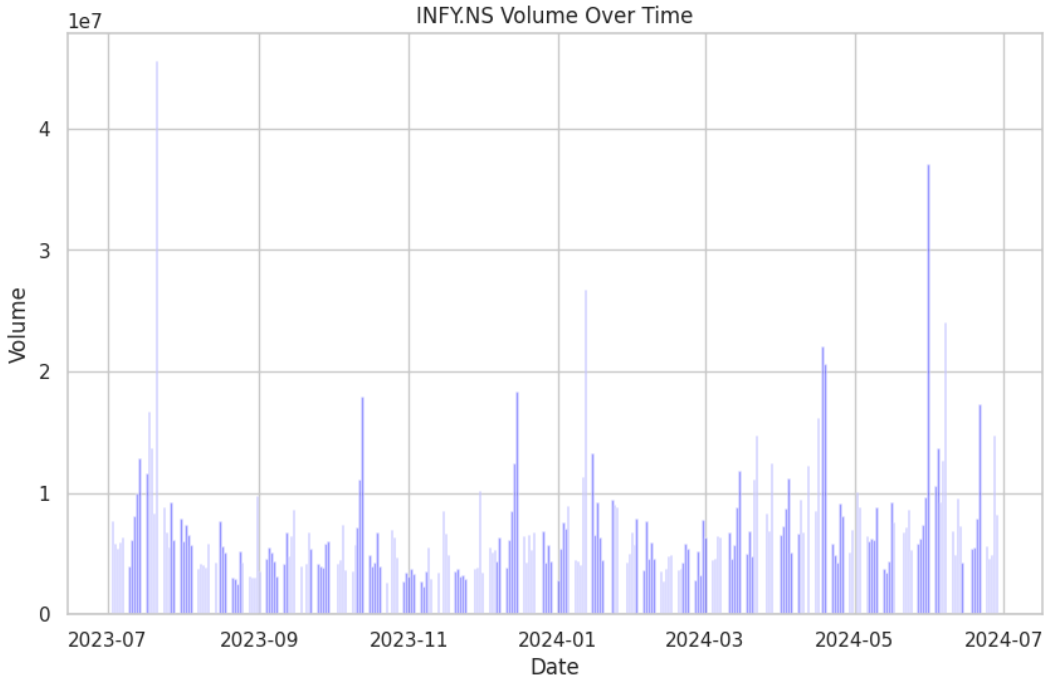
In [42]:

```
# Calculate Moving Averages (20-day and 50-day) for Infosys
infosys_data['MA20'] = infosys_data['Close'].rolling(window=20).mean()
infosys_data['MA50'] = infosys_data['Close'].rolling(window=50).mean()

# Calculate Bollinger Bands
infosys_data['BB_Middle'] = infosys_data['MA20']  # Middle Bollinger Band (
infosys_data['BB_Upper'] = infosys_data['BB_Middle'] + (2 * infosys_data['Clo
infosys_data['BB_Lower'] = infosys_data['BB_Middle'] - (2 * infosys_data['Clo

# Plot Moving Averages and Bollinger Bands
plt.figure(figsize=(14, 8))
plt.plot(infosys_data['Close'], label='Closing Price', color='blue', alpha=0.5)
plt.plot(infosys_data['MA20'], label='20-Day MA', color='red', linestyle='--')
plt.plot(infosys_data['MA50'], label='50-Day MA', color='green', linestyle='--'

# Fill Bollinger Bands
plt.fill_between(infosys_data.index, infosys_data['BB_Upper'], infosys_data[

plt.title('INFY.NS Moving Averages and Bollinger Bands')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend(loc='best')
plt.grid(True)
plt.show()

```



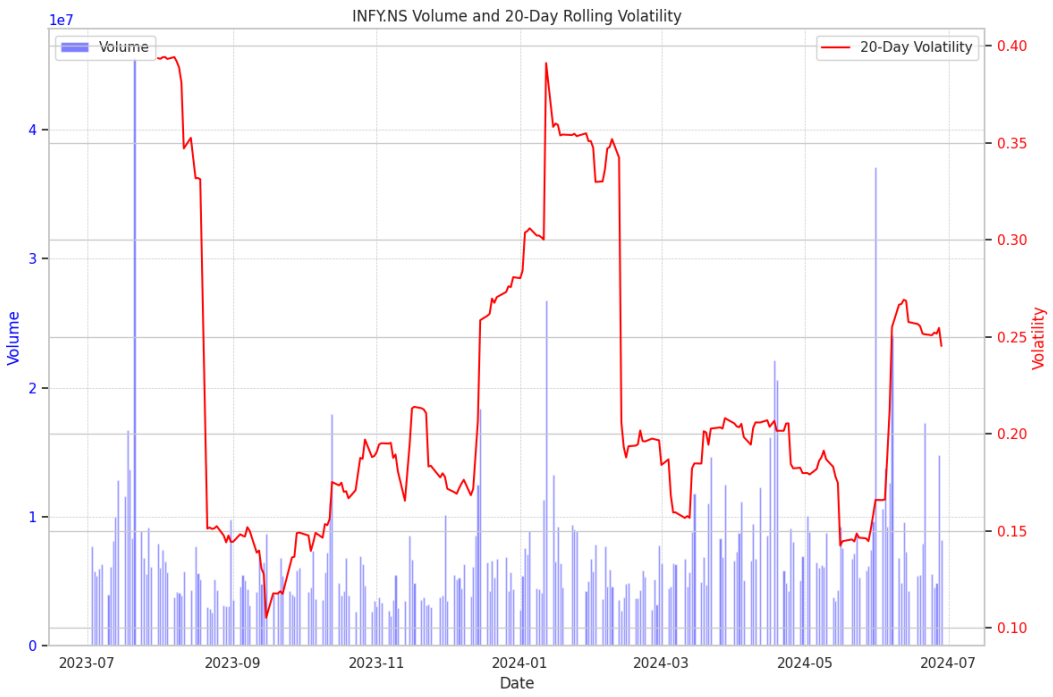
In [43]:

```
# Volume Analysis for Infosys Stock
plt.figure(figsize=(10, 6))
plt.bar(infosys_data.index, infosys_data['Volume'], color='blue', alpha=0.5)
plt.title('INFY.NS Volume Over Time')
plt.xlabel('Date')
plt.ylabel('Volume')
plt.grid(True)
plt.show()
```



In [44]:

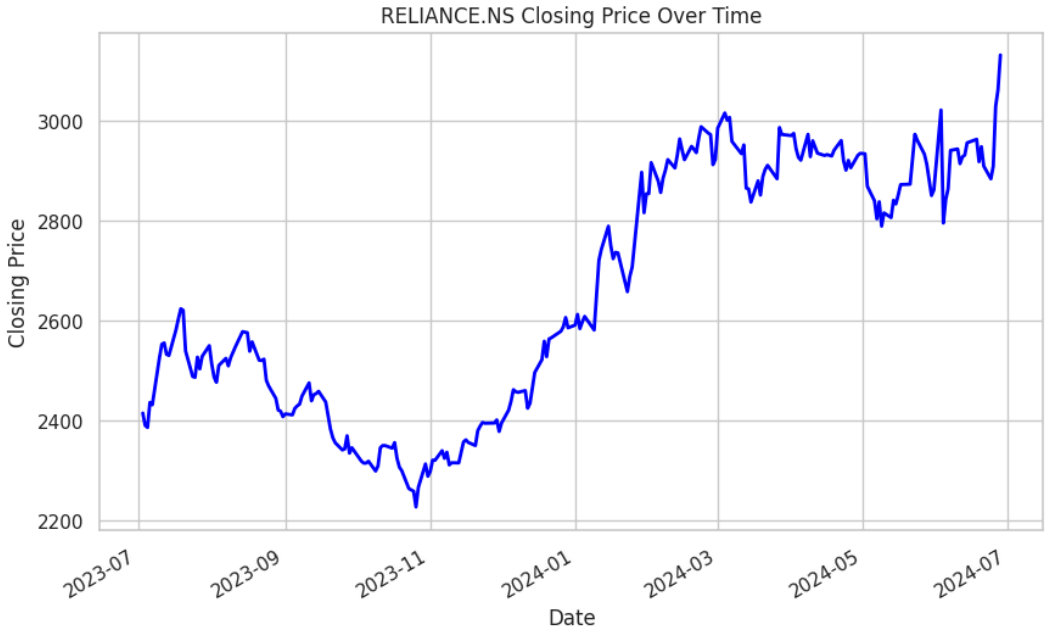
```
# Calculate daily returns for Infoysy Stock
infosys_data['Returns'] = infosys_data['Close'].pct_change()

# Calculate rolling volatility (e.g., 20-day standard deviation of returns)
infosys_data['Volatility'] = infosys_data['Returns'].rolling(window=20).std() *

# Create the figure and primary axis
fig, ax1 = plt.subplots(figsize=(12, 8))

# Plot Volume on the primary y-axis
ax1.bar(infosys_data.index, infosys_data['Volume'], color='blue', alpha=0.5
ax1.set_xlabel('Date')
ax1.set_ylabel('Volume', color='blue')
ax1.tick_params(axis='y', labelcolor='blue')
ax1.grid(True, which='both', linestyle='--', linewidth=0.5)

# Create a secondary y-axis to plot the Volatility
ax2 = ax1.twinx()
ax2.plot(infosys_data.index, infosys_data['Volatility'], color='red', label='20-
ax2.set_ylabel('Volatility', color='red')
ax2.tick_params(axis='y', labelcolor='red')

# Titles and legends
plt.title('INFY.NS Volume and 20-Day Rolling Volatility')
fig.tight_layout()
ax1.legend(loc='upper left')
ax2.legend(loc='upper right')

plt.show()
```

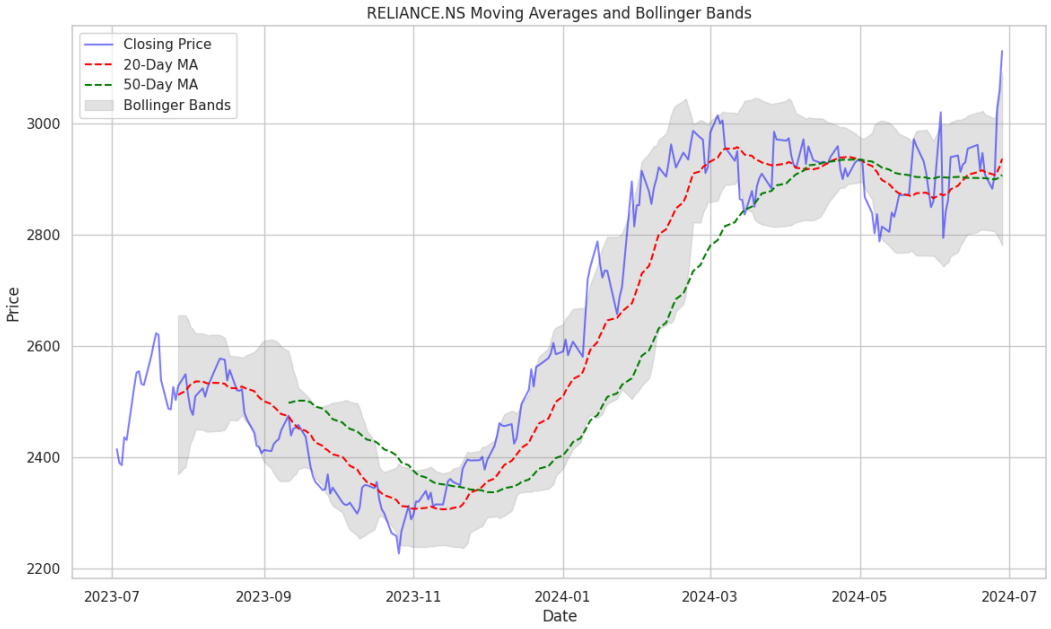


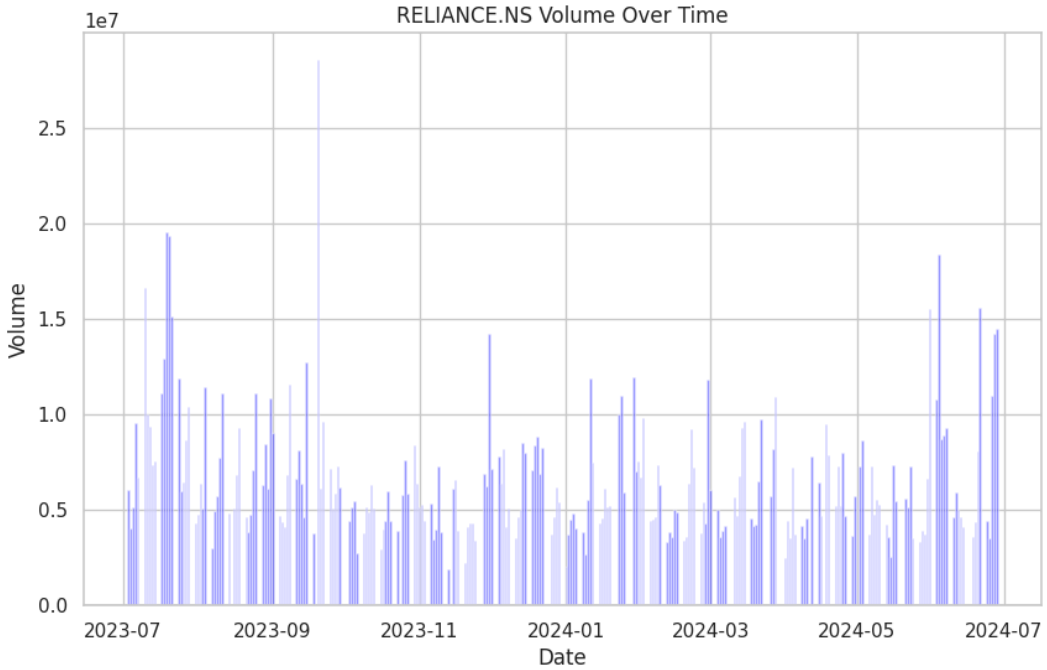
RELIANCE STOCK

In [45]:

```
# Filter data for the Reliance stock
reliance_data = data[data['Ticker'] == 'RELIANCE.NS'].copy()

# Convert 'Date' column to datetime format and set it as index
reliance_data['Date'] = pd.to_datetime(reliance_data['Date'])
reliance_data.set_index('Date', inplace=True)

# Plot the closing price over time
plt.figure(figsize=(10, 6))
reliance_data['Close'].plot(title='RELIANCE.NS Closing Price Over Time', col
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.grid(True)
plt.show()

# Calculate Moving Averages (20-day and 50-day)
reliance_data['MA20'] = reliance_data['Close'].rolling(window=20).mean()
reliance_data['MA50'] = reliance_data['Close'].rolling(window=50).mean()

# Calculate Bollinger Bands
reliance_data['BB_Middle'] = reliance_data['MA20']  # Middle Bollinger Bar
reliance_data['BB_Upper'] = reliance_data['BB_Middle'] + (2 * reliance_dat
reliance_data['BB_Lower'] = reliance_data['BB_Middle'] - (2 * reliance_dat

# Plot Moving Averages and Bollinger Bands
plt.figure(figsize=(14, 8))
plt.plot(reliance_data['Close'], label='Closing Price', color='blue', alpha=0.5
plt.plot(reliance_data['MA20'], label='20-Day MA', color='red', linestyle='--')
plt.plot(reliance_data['MA50'], label='50-Day MA', color='green', linestyle='

# Fill Bollinger Bands
plt.fill_between(reliance_data.index, reliance_data['BB_Upper'], reliance_d

plt.title('RELIANCE.NS Moving Averages and Bollinger Bands')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend(loc='best')
plt.grid(True)
plt.show()

# Volume Analysis
plt.figure(figsize=(10, 6))
plt.bar(reliance_data.index, reliance_data['Volume'], color='blue', alpha=0
plt.title('RELIANCE.NS Volume Over Time')
plt.xlabel('Date')
plt.ylabel('Volume')
plt.grid(True)
plt.show()
```

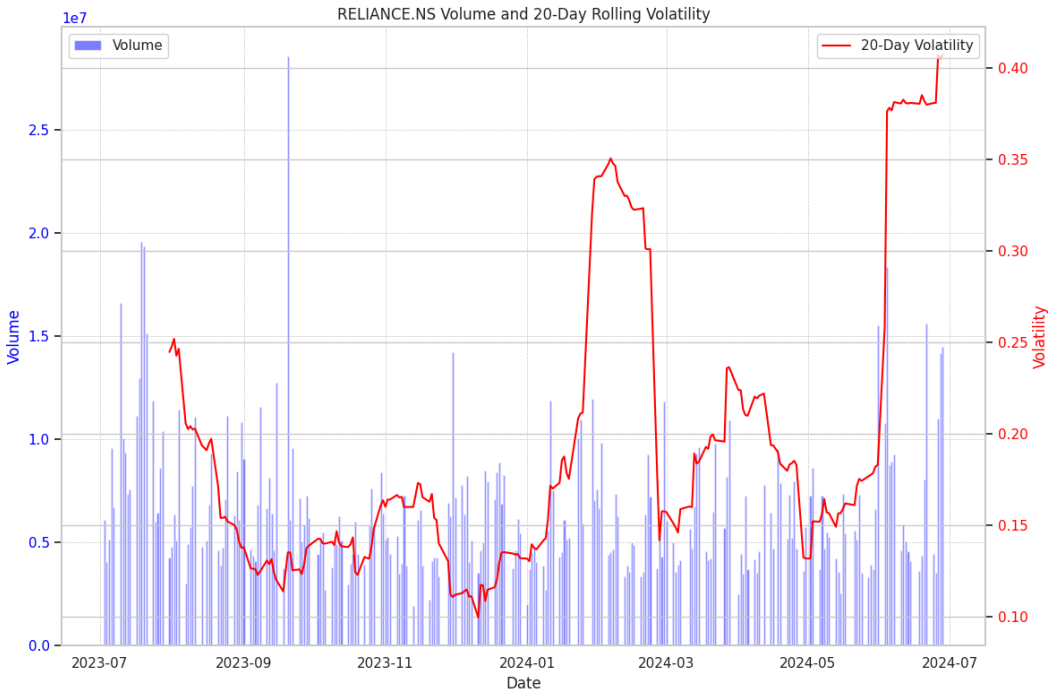

RELIANCE.NS Closing Price Over Time
Closing Price
3000
2800
2600
2400
2200
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


RELIANCE.NS Moving Averages and Bollinger Bands
Closing Price
20-Day MA
50-Day MA
Bollinger Bands
Price
3000
2800
2600
2400
2200
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


RELIANCE.NS Volume Over Time
1e7
Volume
2.5
2.0
1.5
1.0
0.5
0.0
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date

In [46]:

```
# Calculate daily returns for Reliance Stock
reliance_data['Returns'] = reliance_data['Close'].pct_change()

# Calculate rolling volatility (e.g., 20-day standard deviation of returns)
reliance_data['Volatility'] = reliance_data['Returns'].rolling(window=20).std

# Create the figure and primary axis
fig, ax1 = plt.subplots(figsize=(12, 8))

# Plot Volume on the primary y-axis
ax1.bar(reliance_data.index, reliance_data['Volume'], color='blue', alpha=
ax1.set_xlabel('Date')
ax1.set_ylabel('Volume', color='blue')
ax1.tick_params(axis='y', labelcolor='blue')
ax1.grid(True, which='both', linestyle='--', linewidth=0.5)

# Create a secondary y-axis to plot the Volatility
ax2 = ax1.twinx()
ax2.plot(reliance_data.index, reliance_data['Volatility'], color='red', label=
ax2.set_ylabel('Volatility', color='red')
ax2.tick_params(axis='y', labelcolor='red')

# Titles and legends
plt.title('RELIANCE.NS Volume and 20-Day Rolling Volatility')
fig.tight_layout()
ax1.legend(loc='upper left')
ax2.legend(loc='upper right')

plt.show()
```

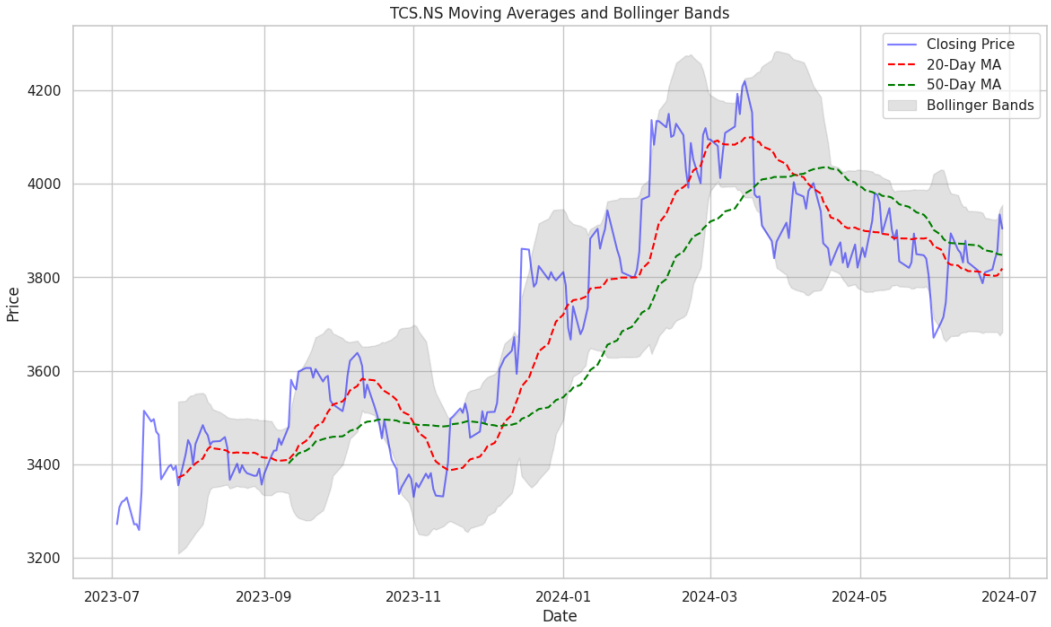


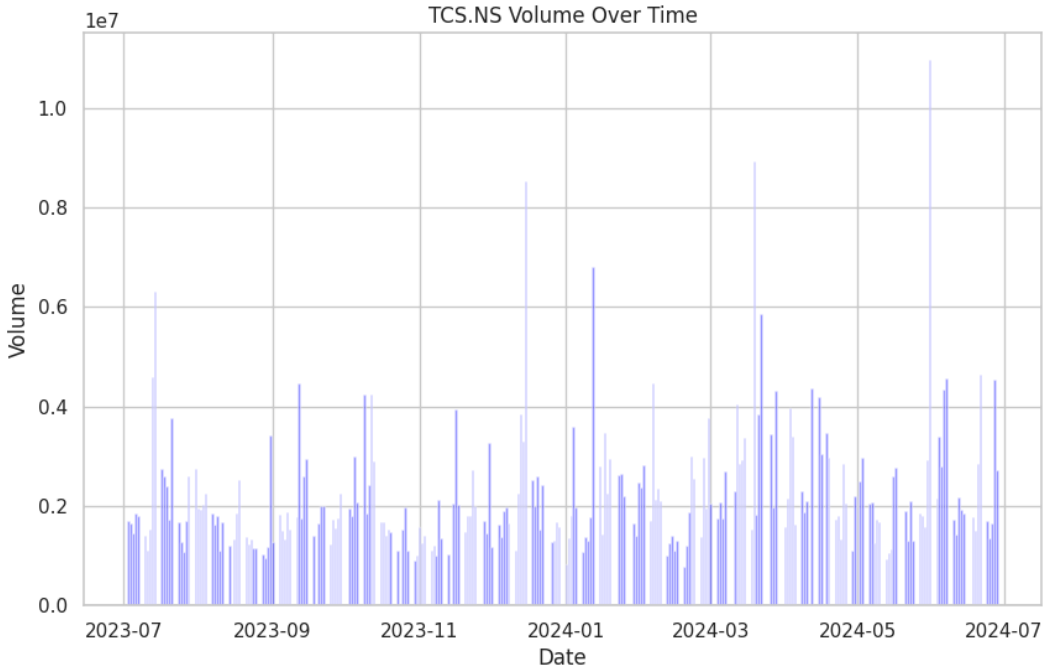
TCS STOCK

In [47]:

```
# Filter data for the TCS stock
tcs_data = data[data['Ticker'] == 'TCS.NS'].copy()

# Convert 'Date' column to datetime format and set it as index
tcs_data['Date'] = pd.to_datetime(tcs_data['Date'])
tcs_data.set_index('Date', inplace=True)

# Plot the closing price over time
plt.figure(figsize=(10, 6))
tcs_data['Close'].plot(title='TCS.NS Closing Price Over Time', color='blue', lw
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.grid(True)
plt.show()

# Calculate Moving Averages (20-day and 50-day)
tcs_data['MA20'] = tcs_data['Close'].rolling(window=20).mean()
tcs_data['MA50'] = tcs_data['Close'].rolling(window=50).mean()

# Calculate Bollinger Bands
tcs_data['BB_Middle'] = tcs_data['MA20']  # Middle Bollinger Band (20-day
tcs_data['BB_Upper'] = tcs_data['BB_Middle'] + (2 * tcs_data['Close'].rolling
tcs_data['BB_Lower'] = tcs_data['BB_Middle'] - (2 * tcs_data['Close'].rolling(

# Plot Moving Averages and Bollinger Bands
plt.figure(figsize=(14, 8))
plt.plot(tcs_data['Close'], label='Closing Price', color='blue', alpha=0.5)
plt.plot(tcs_data['MA20'], label='20-Day MA', color='red', linestyle='--')
plt.plot(tcs_data['MA50'], label='50-Day MA', color='green', linestyle='--')

# Fill Bollinger Bands
plt.fill_between(tcs_data.index, tcs_data['BB_Upper'], tcs_data['BB_Lower']

plt.title('TCS.NS Moving Averages and Bollinger Bands')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend(loc='best')
plt.grid(True)
plt.show()

# Volume Analysis
plt.figure(figsize=(10, 6))
plt.bar(tcs_data.index, tcs_data['Volume'], color='blue', alpha=0.5)
plt.title('TCS.NS Volume Over Time')
plt.xlabel('Date')
plt.ylabel('Volume')
plt.grid(True)
plt.show()
```


TCS.NS Closing Price Over Time
Closing Price
4200
4000
3800
3600
3400
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


TCS.NS Moving Averages and Bollinger Bands
Closing Price
20-Day MA
50-Day MA
Bollinger Bands
Price
4200
4000
3800
3600
3400
3200
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date


TCS.NS Volume Over Time
1e7
Volume
1.0
0.8
0.6
0.4
0.2
0.0
2023-07
2023-09
2023-11
2024-01
2024-03
2024-05
2024-07
Date

In [48]:

```
# Calculate daily returns of TCS Bank
tcs_data['Returns'] = tcs_data['Close'].pct_change()

# Calculate rolling volatility (e.g., 20-day standard deviation of returns)
tcs_data['Volatility'] = tcs_data['Returns'].rolling(window=20).std() * (252**0

# Create the figure and primary axis
fig, ax1 = plt.subplots(figsize=(12, 8))

# Plot Volume on the primary y-axis
ax1.bar(tcs_data.index, reliance_data['Volume'], color='blue', alpha=0.5, l
ax1.set_xlabel('Date')
ax1.set_ylabel('Volume', color='blue')
ax1.tick_params(axis='y', labelcolor='blue')
ax1.grid(True, which='both', linestyle='--', linewidth=0.5)

# Create a secondary y-axis to plot the Volatility
ax2 = ax1.twinx()
ax2.plot(tcs_data.index, tcs_data['Volatility'], color='red', label='20-Day Vo
ax2.set_ylabel('Volatility', color='red')
ax2.tick_params(axis='y', labelcolor='red')

# Titles and legends
plt.title('TCS.NS Volume and 20-Day Rolling Volatility')
fig.tight_layout()
ax1.legend(loc='upper left')
ax2.legend(loc='upper right')

plt.show()
```