Problem statement: Analysis and Visualization of Stock Market Data Tasks to Perform:

1. Import the "Stock_Prices.csv" dataset.
2. Explore the dataset to understand its structure and content.
3. Ensure that the date column is in the appropriate format (e.g., datetime) for time series analysis.
4. Plot line charts or time series plots to visualize the historical stock price trends over time.
5. Calculate and plot moving averages or rolling averages to identify the underlying trends and smooth out noise.
6. Perform seasonality analysis to identify periodic patterns in the stock prices, such as weekly, monthly, or yearly fluctuations.
7. Analyze and plot the correlation between the stock prices and other variables, such as trading volume or market indices.
8. Use autoregressive integrated moving average (ARIMA) models or exponential smoothing models to forecast future stock prices.

In [16]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from statsmodels.tsa.seasonal import seasonal_decompose
import warnings
warnings.filterwarnings('ignore')
%matplotlib inline
```

In [17]:
```
stock_prices = pd.read_csv('stock_prices.csv')
stock_prices.head()
```

Out[17]:

	Date	A	AA	AAPL	ABBV	ABC	ABT	ACN	ADBE
0	2003-07-31	13.790836	53.019848	1.019303	NaN	12.739487	9.022574	15.108545	16.333433
1	2003-08-01	13.676599	51.759747	1.002379	NaN	12.579965	8.859362	15.816516	16.268559
2	2003-08-04	13.682946	52.256149	1.025589	NaN	12.398233	8.850165	15.660917	16.523066
3	2003-08-05	13.219654	51.206055	0.985455	NaN	12.111500	8.700747	15.147444	16.183720
4	2003-08-06	13.060995	50.783653	0.949190	NaN	11.752071	8.873152	14.937387	15.749559

5 rows × 480 columns

In [18]:
```
print("Number of Rows:",stock_prices.shape[0])
print("Number of Columns:",stock_prices.shape[1])
```

```
Number of Rows: 2876
Number of Columns: 480
```

In [19]:
```
stock_prices.dtypes
```

Out[19]:
```
Date     object
A       float64
AA      float64
AAPL    float64
ABBV    float64
         ...
XRX     float64
XYL     float64
YUM     float64
ZION    float64
ZNGA    float64
Length: 480, dtype: object
```

In [20]:
```
stock_prices.columns
```

Out[20]:
```
Index(['Date', 'A', 'AA', 'AAPL', 'ABBV', 'ABC', 'ABT', 'ACN', 'ADBE', 'ADI',
       ...
       'XEL', 'XL', 'XLNX', 'XOM', 'XRAY', 'XRX', 'XYL', 'YUM', 'ZION',
       'ZNGA'],
      dtype='object', length=480)
```

In [21]:
```
stock_prices.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2876 entries, 0 to 2875
Columns: 480 entries, Date to ZNGA
dtypes: float64(479), object(1)
memory usage: 10.5+ MB
```

In [22]:
```
stock_prices.isnull().sum()
```

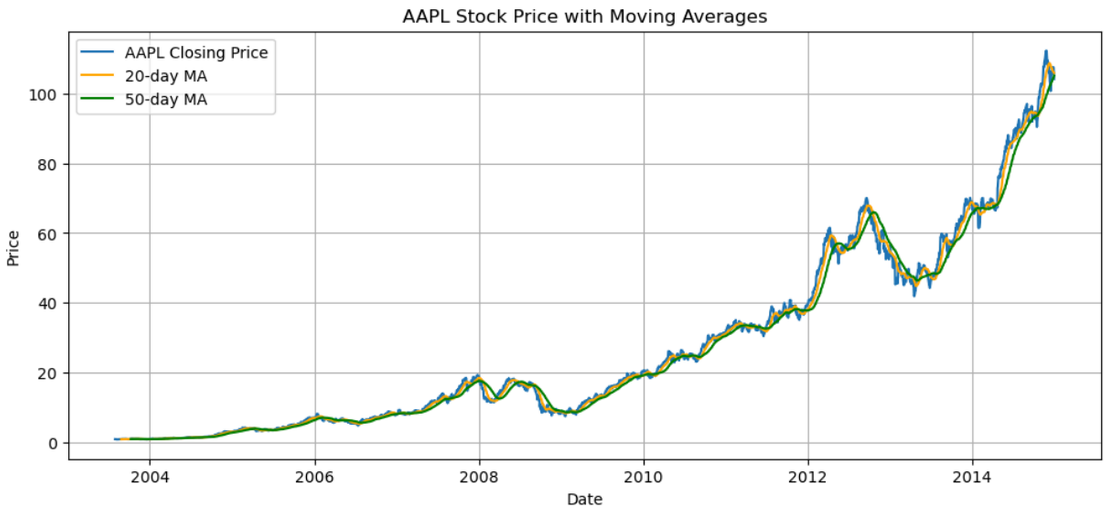
Out[22]:
```
Date       0
A          0
AA         0
AAPL       0
ABBV    2372
          ...
XRX        0
XYL     2067
YUM        0
ZION       0
ZNGA    2112
Length: 480, dtype: int64
```

In [23]:
```
# Step 3: Ensure 'Date' column is datetime type
stock_prices['Date'] = pd.to_datetime(stock_prices['Date'])
stock_prices.set_index('Date', inplace=True)  # Set Date as index for time series
```

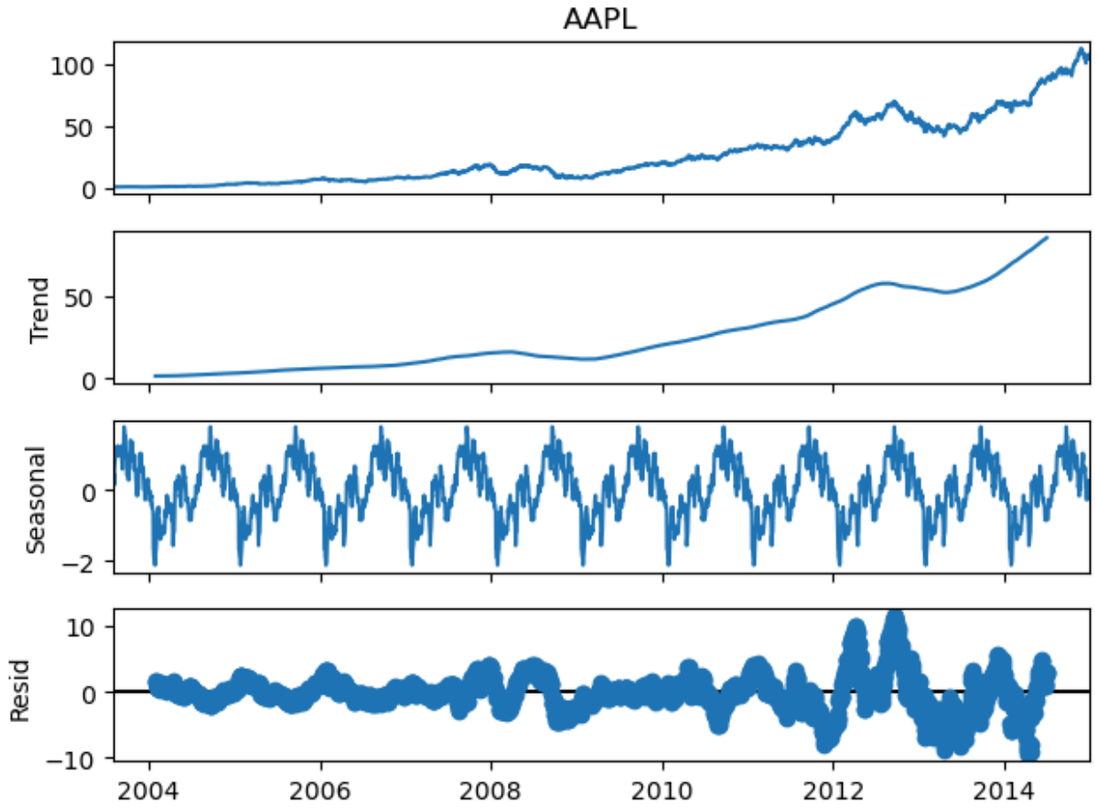
In [25]:
```
# Step 4: Plot historical stock price trend
plt.figure(figsize=(12,5))
plt.plot(stock_prices['AAPL'], label='AAPL Closing Price')
plt.title('AAPL Stock Price Over Time')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend()
plt.grid()
plt.show()
```

In [26]:
```
# Step 5: Calculate and plot moving averages
stock_prices['AAPL_MA_20'] = stock_prices['AAPL'].rolling(window=20).mean()  # 20-a
stock_prices['AAPL_MA_50'] = stock_prices['AAPL'].rolling(window=50).mean()  # 50-a
```

In [28]:
```
plt.figure(figsize=(12,5))
plt.plot(stock_prices['AAPL'], label='AAPL Closing Price')
plt.plot(stock_prices['AAPL_MA_20'], label='20-day MA', color='orange')
plt.plot(stock_prices['AAPL_MA_50'], label='50-day MA', color='green')
plt.title('AAPL Stock Price with Moving Averages')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend()
plt.grid()
plt.show()
```



In [31]:
```
# Step 6: Seasonality analysis using decomposition
decomposition = seasonal_decompose(stock_prices['AAPL'], model='additive', period=2
decomposition.plot()
plt.show()
```


AAPL
100
50
0
Trend
50
0
Seasonal
0
−2
Resid
10
0
−10
2004
2006
2008
2010
2012
2014