PRACTICAL 10

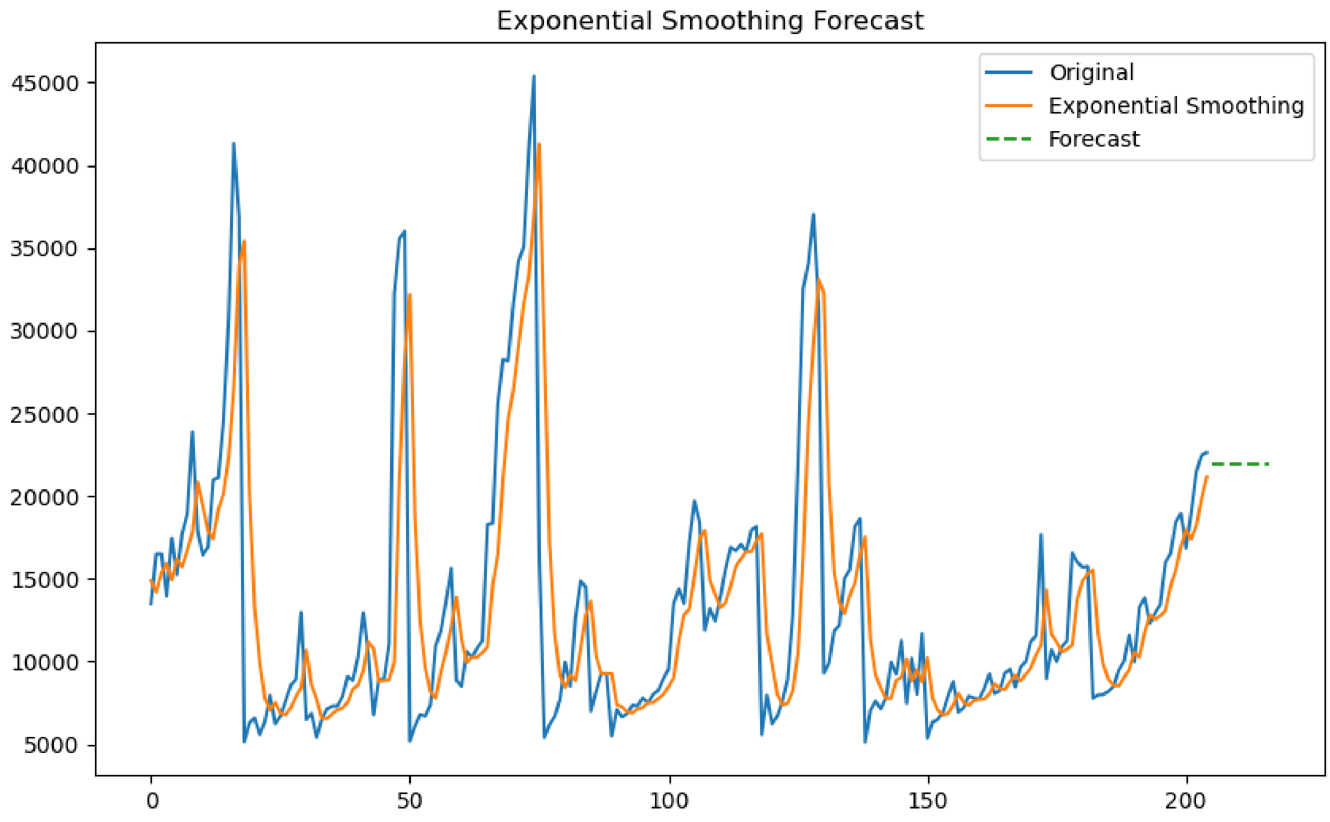
Name:	Harsh Shah	**Semester:**	VII	**Division:**	6
Roll No.:	21BCP359	**Date:**	08-10-24	**Batch:**	G11

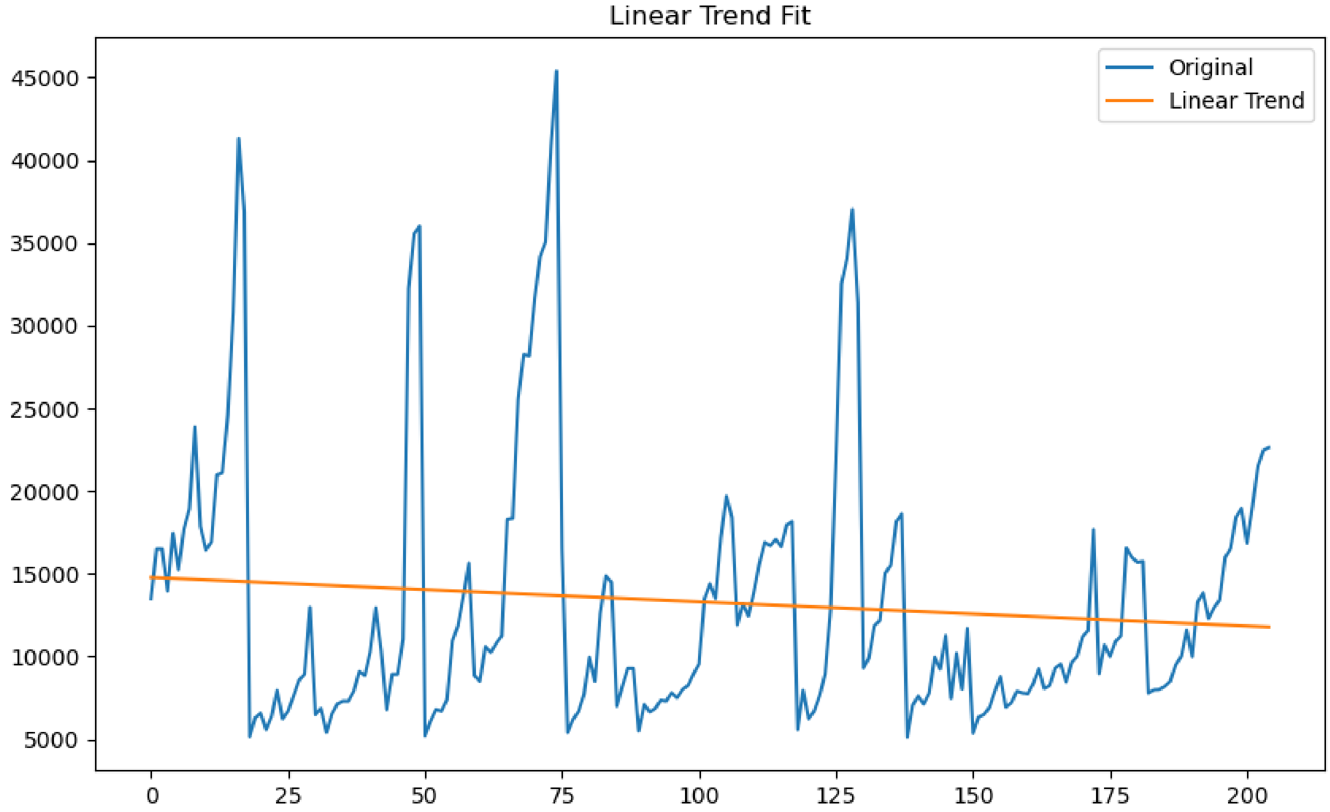
Code

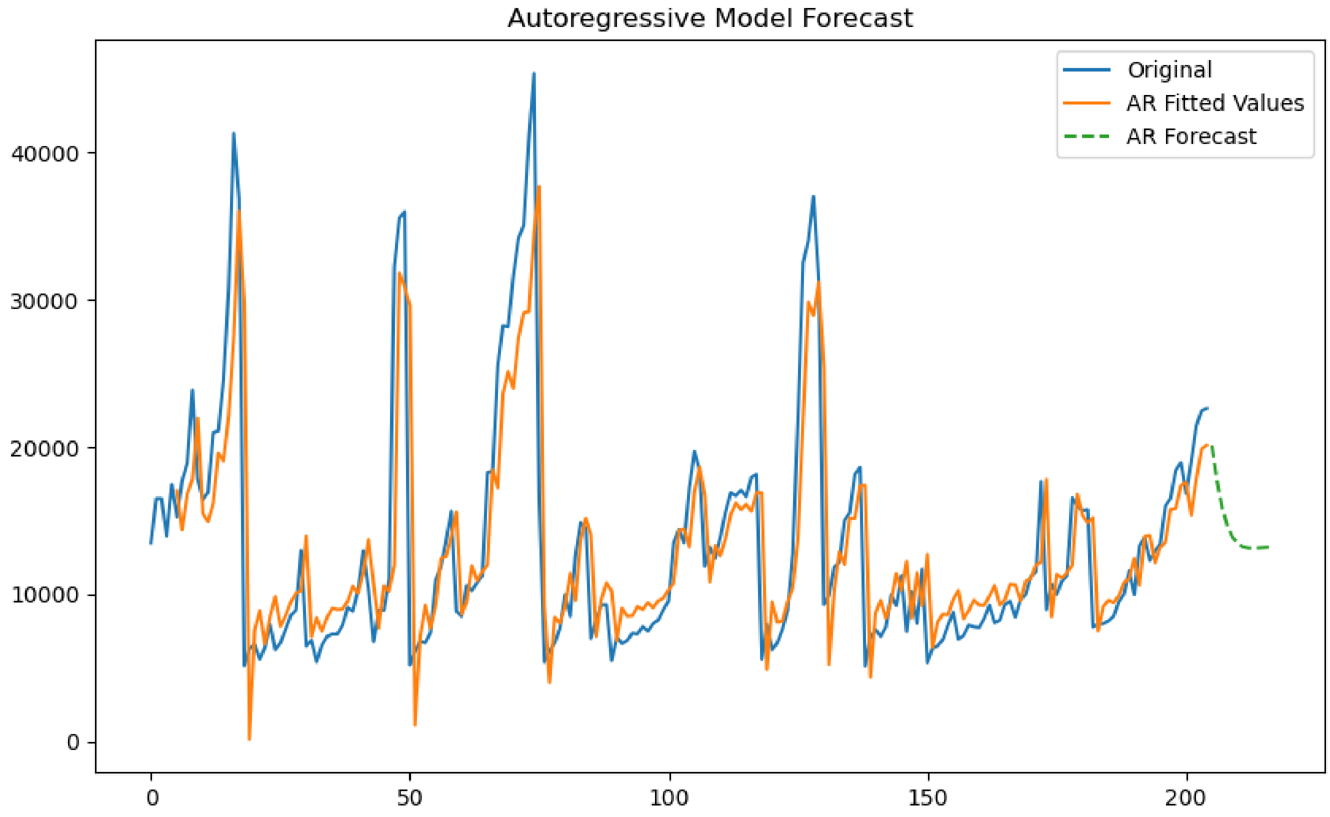
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from statsmodels.tsa.holtwinters import ExponentialSmoothing
from statsmodels.tsa.ar_model import AutoReg
from sklearn.linear_model import LinearRegression

data = pd.read_csv('CarPrice_Assignment.csv')

# Assume data is sequential (e.g., monthly observations)
data['time_index'] = np.arange(len(data))

# Use the 'price' column as the time series target
data['price'] = pd.to_numeric(data['price'], errors='coerce')
data.dropna(subset=['price'], inplace=True)

# Exponential Smoothing Model
exp_model = ExponentialSmoothing(data['price'], seasonal=None, trend=None, damped_trend=False).fit(smoothing_level=0.5)

# Predict future values
exp_forecast = exp_model.forecast(steps=12)

# Plotting
plt.figure(figsize=(10, 6))
plt.plot(data['time_index'], data['price'], label='Original')
plt.plot(data['time_index'], exp_model.fittedvalues, label='Exponential Smoothing')
plt.plot(range(len(data), len(data) + 12), exp_forecast, label='Forecast', linestyle='--')
plt.legend()
plt.title('Exponential Smoothing Forecast')
plt.show()

# Linear Trend Model
# Fit a linear regression model
linear_model = LinearRegression()
linear_model.fit(data[['time_index']], data['price'])

# Predict values using the model
data['linear_trend'] = linear_model.predict(data[['time_index']])

# Plotting
```

```
plt.figure(figsize=(10, 6))
plt.plot(data['time_index'], data['price'], label='Original')
plt.plot(data['time_index'], data['linear_trend'], label='Linear Trend')
plt.legend()
plt.title('Linear Trend Fit')
plt.show()

# Autoregressive Model (AR)
# Fit the AR model with a specified lag
ar_model = AutoReg(data['price'], lags=5).fit()

# Predict future values using the AR model
ar_forecast = ar_model.predict(start=len(data), end=len(data) + 11)

# Plotting
plt.figure(figsize=(10, 6))
plt.plot(data['time_index'], data['price'], label='Original')
plt.plot(ar_model.fittedvalues.index, ar_model.fittedvalues, label='AR Fitted Values')
plt.plot(range(len(data), len(data) + 12), ar_forecast, label='AR Forecast', linestyle='--')
plt.legend()
plt.title('Autoregressive Model Forecast')
plt.show()
```

Output




Linear Trend Fit
Original
Linear Trend
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
25
50
75
100
125
150
175
200


Autoregressive Model Forecast
Original
AR Fitted Values
AR Forecast
40000
30000
20000
10000
0
0
50
100
150
200