EX:No.4 221501046

Program for estimating and eliminating trend in time series data using aggregation and smoothing techniques.

Aim:

Write a program to estimate and remove trends in a time series using resampling (aggregation) and smoothing methods like moving average.

Algorithm:

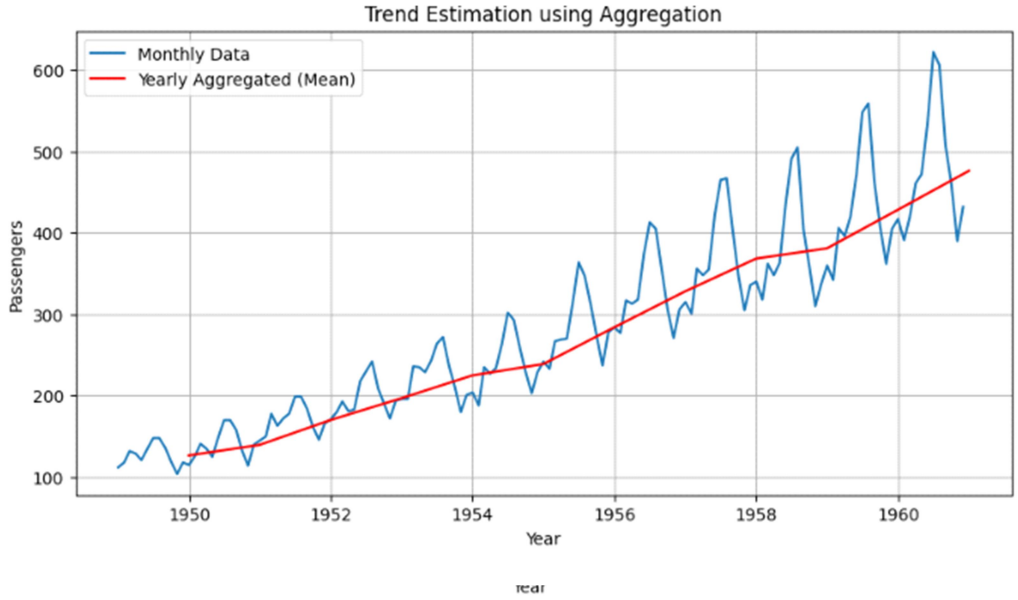
1. Import Libraries: Import pandas and matplotlib.
2. Load Dataset: Upload and load the AirPassengers dataset.
3. Convert & Set Index: Convert the date column to datetime and set it as the index.
4. Set Frequency: Ensure monthly frequency is set.
5. Resample Data: Use yearly aggregation to smooth long-term trend.
6. Rolling Mean: Apply moving average smoothing (e.g., 12-month) to reduce noise.
7. Visualize Trend Removal: Plot original vs aggregated and smoothed series to compare.

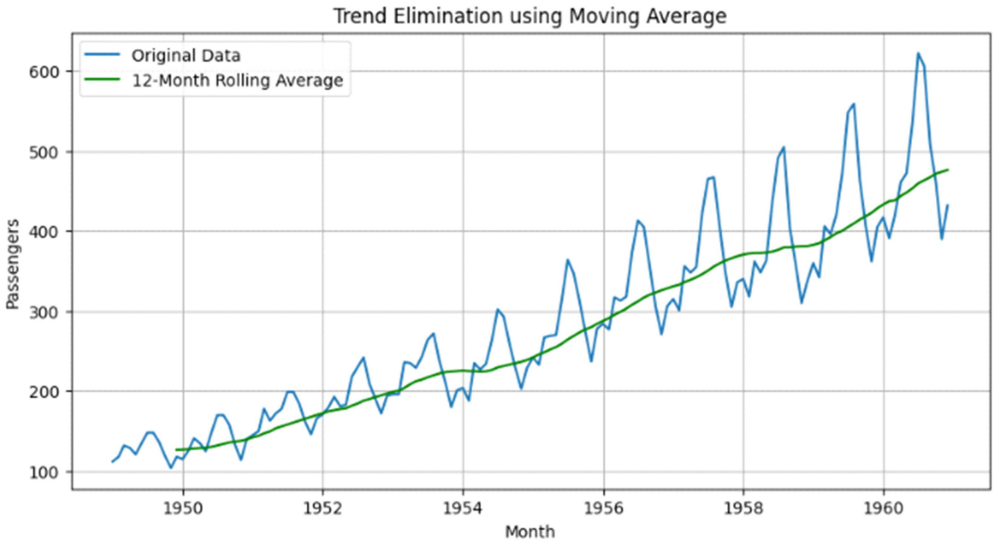
Code:

```
import pandas as pd
import matplotlib.pyplot as plt
from google.colab import files
uploaded = files.upload()
df = pd.read_csv('AirPassengers.csv')
df.columns = ['Month', 'Passengers']
df['Month'] = pd.to_datetime(df['Month'])
df.set_index('Month', inplace=True)
df = df.asfreq('MS')
```

```
yearly_avg = df['Passengers'].resample('A').mean()
plt.figure(figsize=(10, 5))
plt.plot(df['Passengers'], label='Monthly Data')
plt.plot(yearly_avg, label='Yearly Aggregated (Mean)', color='red')
plt.title('Trend Estimation using Aggregation')
plt.xlabel('Year')
plt.ylabel('Passengers')
plt.legend()
plt.grid(True)
plt.show()
rolling_avg = df['Passengers'].rolling(window=12).mean()
plt.figure(figsize=(10, 5))
plt.plot(df['Passengers'], label='Original Data')
plt.plot(rolling_avg, label='12-Month Rolling Average', color='green')
plt.title('Trend Elimination using Moving Average')
plt.xlabel('Month')
plt.ylabel('Passengers')
plt.legend()
plt.grid(True)
plt.show()
```

Output:





Result:

Thus, the program using the time series data implementation has been done successfully.