

EXERCISE NO 05

ESTIMATING AND ELIMINATING TREND - AGGREGATION SMOOTHING

AIM:

To estimate and eliminate trends in time series dataset by aggregation and smoothing.

PROCEDURE:

1. Import the necessary libraries.

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
```

2. Load the time series data.

```
df = pd.read_csv("../amazon.csv", encoding='latin1')
```

3. Pre-process the data.

```
month_map = {
    'Janeiro': 'January', 'Fevereiro': 'February', 'Março': 'March',
    'Abril': 'April', 'Maio': 'May', 'Junho': 'June',
    'Julho': 'July', 'Agosto': 'August', 'Setembro': 'September',
    'Outubro': 'October', 'Novembro': 'November', 'Dezembro': 'December'
}

df['month'] = df['month'].map(month_map)
df['date'] = pd.to_datetime(df['month'] + ' ' + df['year'].astype(str), format='%B %Y',
errors='coerce')
df = df.dropna(subset=['date'])
df.set_index('date', inplace=True)
```

4. Aggregate the data.

```
df_monthly = df.resample('M')['number'].sum()
df_yearly = df.resample('Y')['number'].sum()
```

5. Moving average smoothing of the data.

```
df_monthly_smooth = df_monthly.rolling(window=5, center=True).mean()
```

6. Detrend the data using Linear Regression.

```
X = np.arange(len(df_monthly)).reshape(-1, 1)
y = df_monthly.values
```

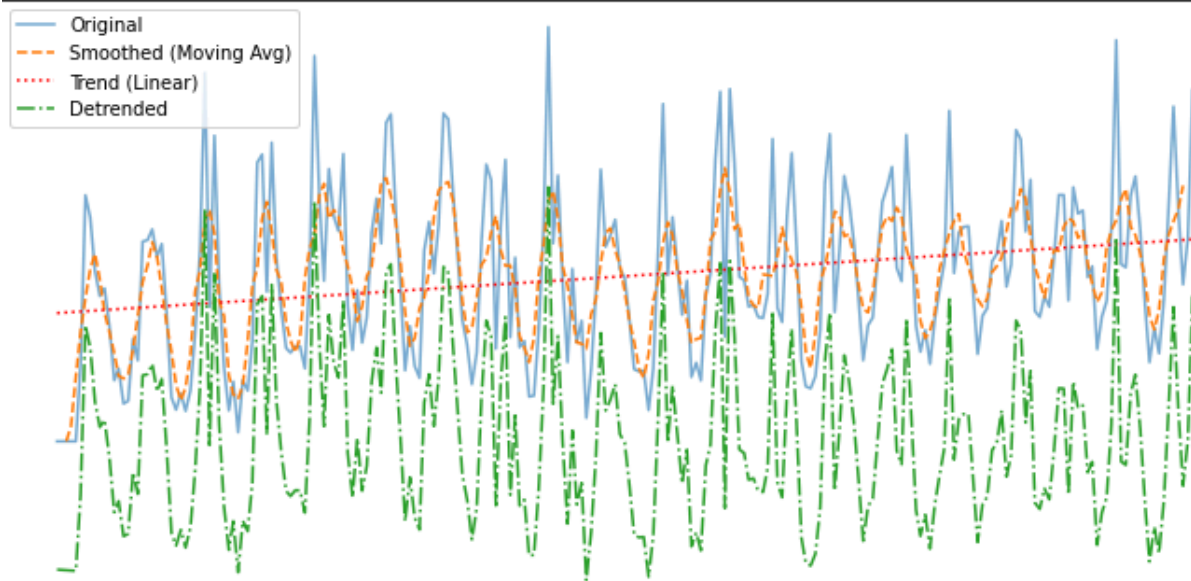
```
model = LinearRegression()
model.fit(X, y)
trend = model.predict(X)
```

```
df_detrended = df_monthly - trend
```

7. Plot the detrended data with the original for visual comparison.

```
plt.figure(figsize=(12, 6))
plt.plot(df_monthly.index, df_monthly, label='Original', alpha=0.6)
plt.plot(df_monthly.index, df_monthly_smooth, label='Smoothed (Moving Avg)',
linestyle='dashed')
plt.plot(df_monthly.index, trend, label='Trend (Linear)', linestyle='dotted', color='red')
plt.plot(df_monthly.index, df_detrended, label='Detrended', linestyle='dashdot')
plt.legend()
plt.title('Trend Estimation and Elimination in Time Series')
plt.show()
```

OUTPUT:



RESULT:

Thus the program has been implemented successfully and verified.