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| **EX.N0 : 5** | **Implement programs for estimating & eliminating trend in time series data- aggregation, smoothing.** |
| **DATE : 20/03/2025** |

**AIM:**

# Implement programs for estimating & eliminating trend in time series data- aggregation, smoothing.

# ALGORITHM:

# Step 1: Import Libraries Step 2: Load the Dataset Step 3: Parse Dates & Set Index Step 4: Select Numeric Column Step 5: Plot Original Time Series Step 6: Trend Estimation using Aggregation Step 7: Plot Aggregated Data Step 8: Apply Moving Average Smoothing Step 9: Plot Smoothed Data

# PROGRAM:

import pandas as pd

import matplotlib.pyplot as plt

# Load the dataset

file\_path = '/mnt/data/climate\_change\_data.csv'

df = pd.read\_csv(file\_path)

# Show column names and data types

print("Columns and Data Types:")

print(df.dtypes)

print("\nFirst few rows:")

display(df.head())

# Convert first column to datetime and set as index

date\_col = df.columns[0]

df[date\_col] = pd.to\_datetime(df[date\_col], errors='coerce')

df.set\_index(date\_col, inplace=True)

# Drop non-numeric columns for analysis

numeric\_df = df.select\_dtypes(include='number')

# Check if we have numeric data

if numeric\_df.empty:

raise ValueError("No numeric columns found to perform trend analysis!")

# Choose the first numeric column for demonstration

value\_col = numeric\_df.columns[0]

print(f"\nUsing column '{value\_col}' for trend analysis.")

# Plot original data

plt.figure(figsize=(12, 5))

plt.plot(numeric\_df[value\_col], label='Original Data')

plt.title('Original Time Series')

plt.xlabel('Date')

plt.ylabel(value\_col)

plt.grid(True)

plt.legend()

plt.show()

# -------- Aggregation (monthly) --------

monthly\_agg = numeric\_df[value\_col].resample('M').mean()

plt.figure(figsize=(12, 5))

plt.plot(monthly\_agg, label='Monthly Aggregated', color='green')

plt.title('Trend Estimation using Aggregation')

plt.xlabel('Date')

plt.ylabel(value\_col)

plt.grid(True)

plt.legend()

plt.show()

# -------- Smoothing (moving average) --------

window\_size = 12

numeric\_df['Smoothed'] = numeric\_df[value\_col].rolling(window=window\_size).mean()

plt.figure(figsize=(12, 5))

plt.plot(numeric\_df[value\_col], label='Original')

plt.plot(numeric\_df['Smoothed'], label='Smoothed (12-point MA)', color='orange')

plt.title('Trend Elimination using Moving Average')

plt.xlabel('Date')

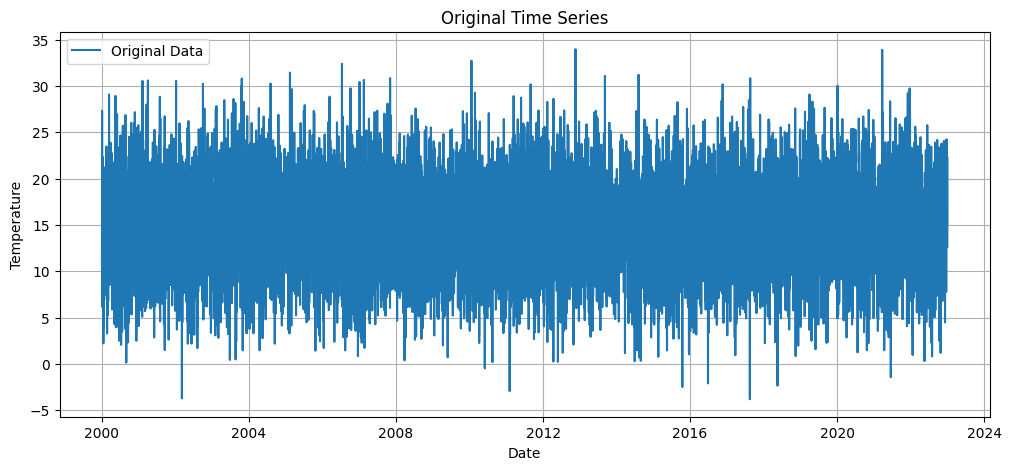
plt.ylabel(value\_col)

plt.grid(True)

plt.legend()

plt.show()

**OUTPUT:**

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**A graph showing a green line

AI-generated content may be incorrect.**

**A graph showing a blue and orange line

AI-generated content may be incorrect.**

# RESULT:

Thus, the program for Implement programs for a time series data is executed successfully.