**Implement program to apply moving average smoothing for data preparation and time series forecasting.**

**EX:No.6**

**DATE: 01/03/25**

# AIM:

To implement program to apply moving average smoothing for data preparation and time series forecasting.

## OBJECTIVE:

To smooth and prepare office supply sales time series data using moving average smoothing techniques to reduce noise, highlight trends, and support basic forecasting.

## BACKGROUND:

* Time series data often contains short-term fluctuations that make trends difficult to observe.
* Moving average smoothing reduces this noise by averaging data points over a fixed window, making trends more visible.
* This smoothed version is easier to analyze and can serve as a foundation for forecasting models.
* Proper data preparation improves the accuracy and interpretability of time series forecasts.

## SCOPEOFTHEPROGRAM:

* Load and clean the office supply sales dataset
* Set the datetime column as the index
* Aggregate sales data by daily frequency
* Apply 30-day moving average smoothing to reduce short-term fluctuations
* Visualize the original vs. smoothed time series to interpret sales trends

## ALGORITHM:

* Import required libraries (pandas, matplotlib)
* Load the dataset and convert the date column to datetime format
* Set the date column as the index of the DataFrame
* Resample the data to obtain daily total sales
* Apply moving average smoothing using a 30-day window
* Plot the original and smoothed series for visual comparison

**CODE:**

import pandas as pd

import matplotlib.pyplot as plt

# Load your AirPassengers dataset

df = pd.read\_csv("/mnt/data/AirPassengers (1).csv")

# Display the first few rows to confirm column names

print(df.head())

# Convert 'Month' column to datetime format

df['Month'] = pd.to\_datetime(df['Month'], format='%Y-%m')

# Set 'Month' as the index

df.set\_index('Month', inplace=True)

# Rename the passenger column if needed

df.rename(columns={df.columns[0]: 'Passengers'}, inplace=True)

# Resample monthly data (though it's already monthly, just in case)

df\_monthly = df['Passengers'].resample('M').sum()

# Apply Moving Average Smoothing (e.g., 12-month window)

window\_size = 12

df\_smooth = df\_monthly.to\_frame(name='Passengers')

df\_smooth['Moving\_Avg'] = df\_smooth['Passengers'].rolling(window=window\_size).mean()

# Plot the original and smoothed time series

plt.figure(figsize=(14, 6))

plt.plot(df\_smooth['Passengers'], label='Original Passenger Count', alpha=0.4)

plt.plot(df\_smooth['Moving\_Avg'], label=f'{window\_size}-Month Moving Average', color='red')

plt.xlabel("Date")

plt.ylabel("Number of Passengers")

plt.title("Air Passenger Trend Estimation using Moving Average Smoothing")

plt.legend()

plt.tight\_layout()

plt.show()

# OUTPUT:

# C:\Users\exam\Downloads\ex 6.PNG

**RESULT:**

Thus,theprogramto apply moving average smoothing for data preparation and time series forecastinghasbeendone successfully.