**EX:No.5 221501034**

**25/03/25**

**IMPLEMENT PROGRAMS FOR ESTIMATING & ELIMINATING TREND IN TIME SERIES DATA – AGGREGATION, SMOOTHING.**

**AIM:**

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

**ALGORITHM:**

1. **Import Libraries**: Load required Python libraries (pandas, numpy, matplotlib, seaborn).
2. **Load Dataset**: Read the Electric\_Production.csv file using pandas.read\_csv().
3. **Preprocess Data**:
   * Strip leading/trailing spaces from column names.
   * Check if the required column (IPG2211A2N) exists.
   * Convert the DATE column to datetime format and set it as the index.
   * Handle missing values by replacing them with the mean.
4. **Aggregation**:
   * Resample data to compute **monthly mean** (M).
   * Resample data to compute **yearly mean** (Y).
5. **Smoothing**:
   * Compute **3-month rolling mean** to reduce short-term fluctuations.
   * Compute **12-month rolling mean** for long-term trend analysis.
6. **Visualization**:
   * Plot **original vs. aggregated data** (monthly, yearly).
   * Plot **original vs. smoothed data** (3-month, 12-month rolling means).
7. **Output Result**: Display a confirmation message.

**PROCESS:**

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

# Load the stock data

file\_path = 'AAPL.csv'

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

# Ensure column names have no leading/trailing spaces

data.columns = data.columns.str.strip()

# Check if 'Adj Close' column exists

if 'Adj Close' not in data.columns:

raise KeyError("'Adj Close' column not found in the dataset. Please check the column name.")

# Convert 'Date' column to datetime format

data['Date'] = pd.to\_datetime(data['Date'])

data.set\_index('Date', inplace=True)

# Handle missing values

data['Adj Close'].fillna(data['Adj Close'].mean(), inplace=True)

# Aggregation: Resampling data to monthly and yearly means

monthly\_data = data['Adj Close'].resample('M').mean()

yearly\_data = data['Adj Close'].resample('Y').mean()

# Smoothing: Using rolling mean to remove short-term fluctuations

rolling\_mean\_3 = data['Adj Close'].rolling(window=3).mean()

rolling\_mean\_12 = data['Adj Close'].rolling(window=12).mean()

# Plotting original data vs aggregated data

plt.figure(figsize=(12, 6))

plt.plot(data['Adj Close'], label='Original Data', alpha=0.5)

plt.plot(monthly\_data, label='Monthly Aggregated', linestyle='dashed')

plt.plot(yearly\_data, label='Yearly Aggregated', linestyle='dotted')

plt.title('AAPL Adjusted Close Price: Aggregated Data')

plt.xlabel('Date')

plt.ylabel('Price')

plt.legend()

plt.grid(True)

plt.show()

# Plotting original vs smoothed data

plt.figure(figsize=(12, 6))

plt.plot(data['Adj Close'], label='Original Data', alpha=0.5)

plt.plot(rolling\_mean\_3, label='3-Day Rolling Mean', linestyle='dashed')

plt.plot(rolling\_mean\_12, label='12-Day Rolling Mean', linestyle='dotted')

plt.title('AAPL Adjusted Close Price: Smoothing Techniques')

plt.xlabel('Date')

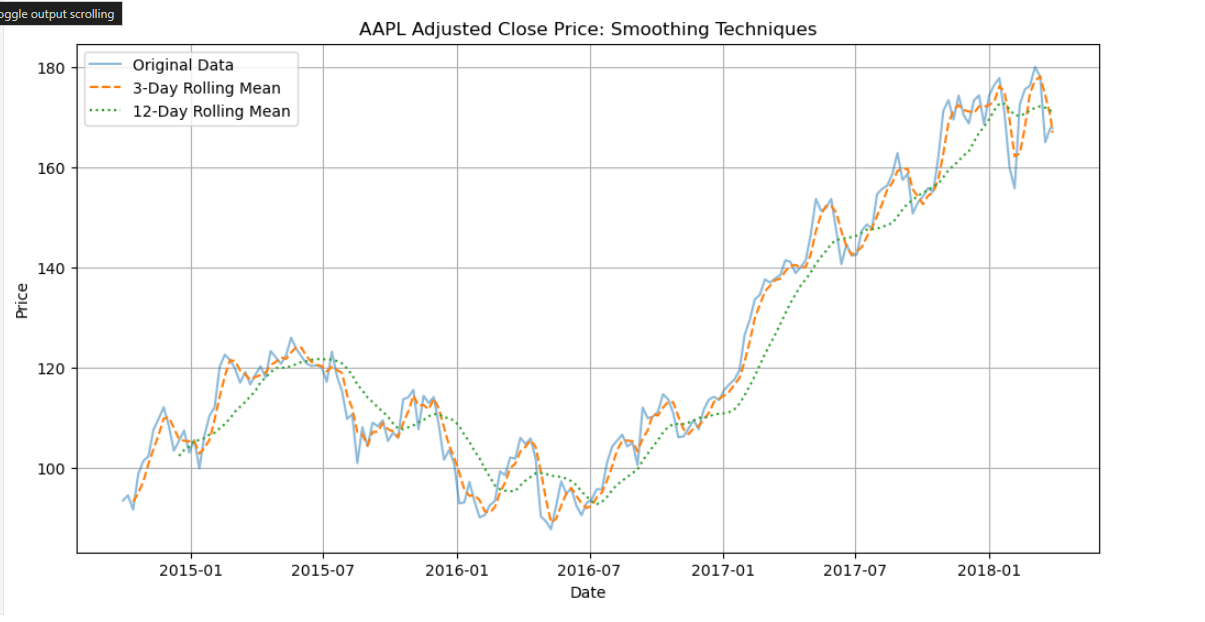
plt.ylabel('Price')

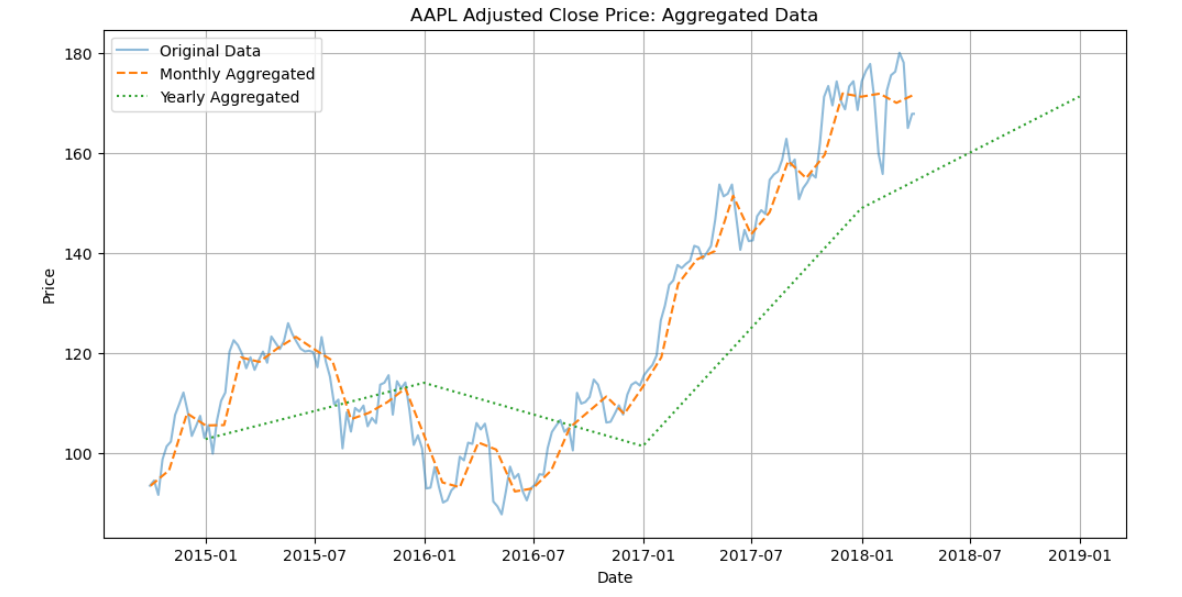
plt.legend()

plt.grid(True)

plt.show()

**OUTPUT:**

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**RESULT:**

The program to Implement estimating & eliminating trend in time series data- aggregation, smoothing is created and executed successfully.