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

| **EX.N0 : 6** | **Implement program to apply moving average smoothing for data preparation and time series forecasting.** |
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| **DATE : 05/04/2025** |

**AIM:**

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

**PROGRAM:**

import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

from sklearn.model\_selection import train\_test\_split

from statsmodels.tsa.holtwinters import SimpleExpSmoothing

file\_path = r"C:\Users\heman\OneDrive\Desktop\abdul\TSA\EX 5\Crude Oil Prices Daily.xlsx" (1)\FINAL\_USO.csv" # Update path

df = pd.read\_csv(file\_path, parse\_dates=["Date"], index\_col="Date")

df.columns = df.columns.str.strip()

if "Adj Close" not in df.columns:

print("Error: 'Adj Close' column not found!")

print("Available columns:", df.columns)

exit()

target = "Adj Close"

df["SMA\_10"] = df[target].rolling(window=10).mean() # 10-day SMA

df["SMA\_20"] = df[target].rolling(window=20).mean() # 20-day SMA

df.dropna(inplace=True) # Remove NaN values from SMA columns

X = df[["SMA\_10", "SMA\_20"]]

y = df[target]

train\_size = int(len(df) \* 0.8) # 80% train, 20% test

X\_train, X\_test = X.iloc[:train\_size], X.iloc[train\_size:]

y\_train, y\_test = y.iloc[:train\_size], y.iloc[train\_size:]

model = SimpleExpSmoothing(y\_train).fit(smoothing\_level=0.2, optimized=False) forecast = model.forecast(len(y\_test)) # Predict the same length as test set

forecast.index = y\_test.index

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

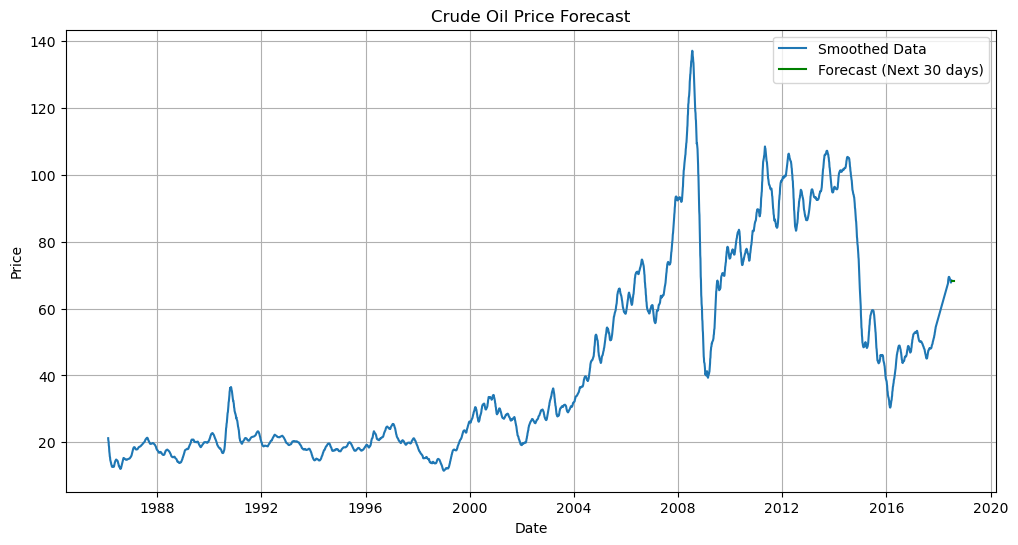
plt.plot(y.index, y, label="Actual Price", color="blue", alpha=0.5)

plt.plot(y\_test.index, forecast, label="Forecast", color="red", linestyle="dashed") plt.title("Gold Price Forecast using Moving Average & Exponential Smoothing") plt.xlabel("Date")

plt.ylabel("Price")

plt.legend()

plt.show()

**OUTPUT:**

**RESULT:**

Thus, the program for Implement program to apply moving average smoothing for data preparation and time series forecasting is executed successfully.