

Program to check the stationarity of a time series data.**Aim:**

Write a program to test the stationarity of a time series dataset using visual techniques (rolling statistics) and statistical techniques (Augmented Dickey-Fuller test).

Algorithm:

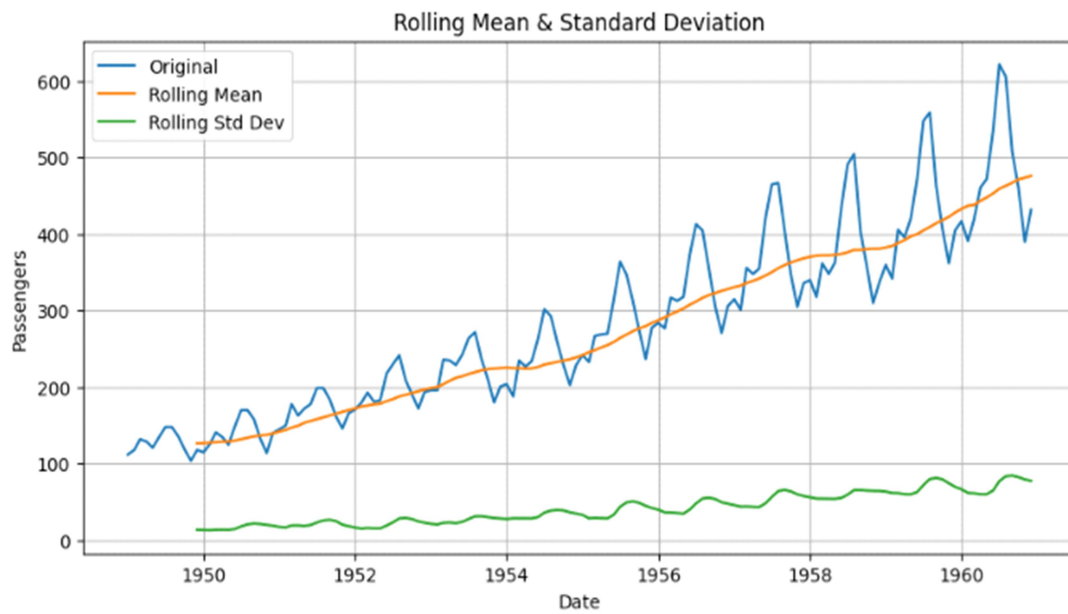
1. Import Libraries: Import pandas, matplotlib, and the ADF test from statsmodels.
2. Load Dataset: Upload and load the AirPassengers dataset.
3. Datetime Conversion: Convert the 'Month' column to datetime and set it as the index.
4. Set Frequency: Ensure monthly frequency for the series.
5. Rolling Statistics: Calculate and plot rolling mean and standard deviation to visualize stationarity.
6. ADF Test: Apply Augmented Dickey-Fuller test to check stationarity statistically.
7. Print Results: Interpret the test statistic and p-value to determine stationarity.

Code:

```
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.stattools import adfuller
from google.colab import files
uploaded = files.upload()
df = pd.read_csv('AirPassengers.csv')
df.columns = ['Month', 'Passengers']
df['Month'] = pd.to_datetime(df['Month'])
df.set_index('Month', inplace=True)
```

```
df = df.asfreq('MS')
rolling_mean = df['Passengers'].rolling(window=12).mean()
rolling_std = df['Passengers'].rolling(window=12).std()
plt.figure(figsize=(10, 5))
plt.plot(df['Passengers'], label='Original')
plt.plot(rolling_mean, label='Rolling Mean')
plt.plot(rolling_std, label='Rolling Std Dev')
plt.title('Rolling Mean & Standard Deviation')
plt.xlabel('Date')
plt.ylabel('Passengers')
plt.legend()
plt.grid(True)
plt.show()
result = adfuller(df['Passengers'])
print('ADF Statistic:', result[0])
print('p-value:', result[1])
print('Critical Values:')
for key, value in result[4].items():
    print(f'    {key}: {value}')
```

Output:



ADF Statistic: 0.8153688792060498
p-value: 0.991880243437641
Critical Values:
1%: -3.4816817173418295
5%: -2.8840418343195267
10%: -2.578770059171598

Result:

Thus, the program using the time series data implementation has been done successfully.

