

Ex.no.4

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Implement programs to check stationary of a time series data

AIM

Implement programs to check stationary of a time series data using google stock dataset.

PROCEDURE:

Step 1: Load and Preprocess the Data

```
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.stattools import adfuller
```

Step 2: Loading the dataset

```
file_path = "C:/mnt/data/GOOGL.csv"
df = pd.read_csv(file_path)
```

Step 3: Visualization

```
plt.figure(figsize=(12, 6))
plt.plot(df['Close'], label='Closing Price', color='blue')
plt.title("Google Stock Closing Price Over Time")
plt.xlabel("Year")
plt.ylabel("Closing Price (USD)")
plt.legend()
plt.grid()
plt.show()
```

Step 4: Check for Stationarity

```
def test_stationarity(timeseries):
    rolling_mean = timeseries.rolling(window=12).mean()
    rolling_std = timeseries.rolling(window=12).std()

    plt.figure(figsize=(12,6))
    plt.plot(timeseries, label="Original", color='blue', alpha=0.5)
    plt.plot(rolling_mean, label="Rolling Mean", color='red')
    plt.plot(rolling_std, label="Rolling Std Dev", color='green')
    plt.title("Rolling Mean & Standard Deviation")
```

```

plt.xlabel("Year")
plt.ylabel("Value")
plt.legend()
plt.grid()
plt.show()

```

```

print("Results of Augmented Dickey-Fuller Test:")
adf_test = adfuller(timeseries.dropna(), autolag="AIC")
results = pd.Series(adf_test[:4], index=["Test Statistic", "p-value",
"# Lags Used", "# Observations Used"])
for key, value in adf_test[4].items():
    results[f"Critical Value ({key})"] = value
print(results)

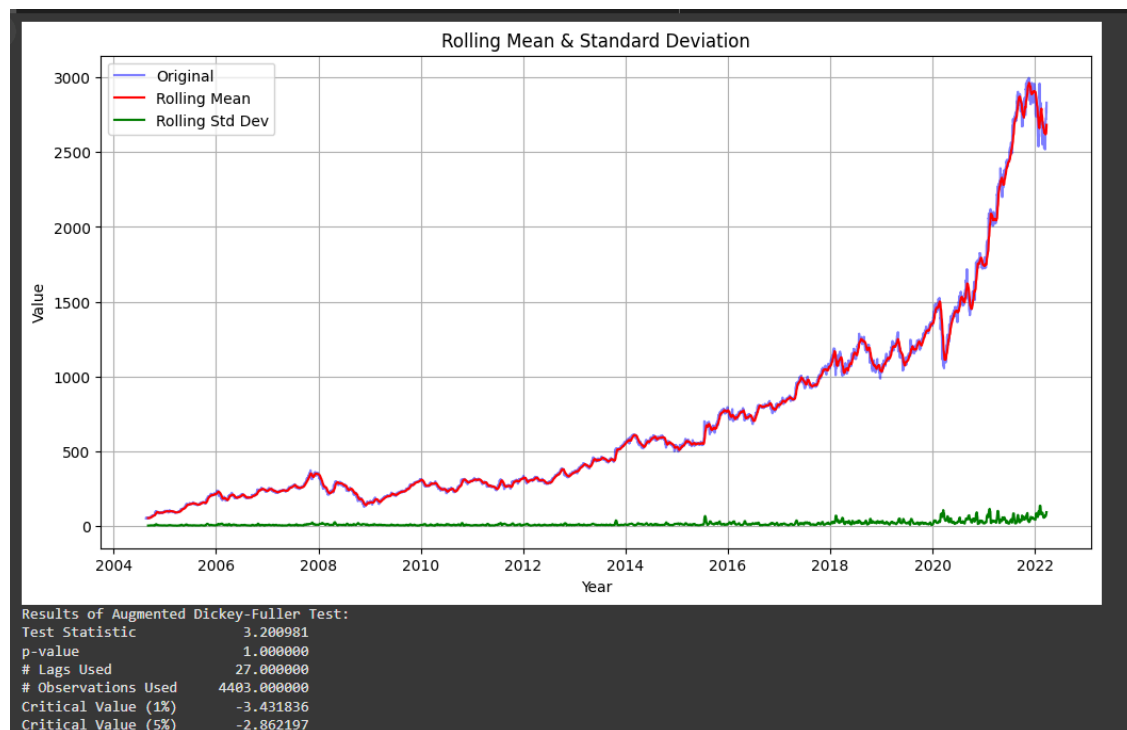
```

Step 4: Apply Differencing to Make the Data Stationary

```

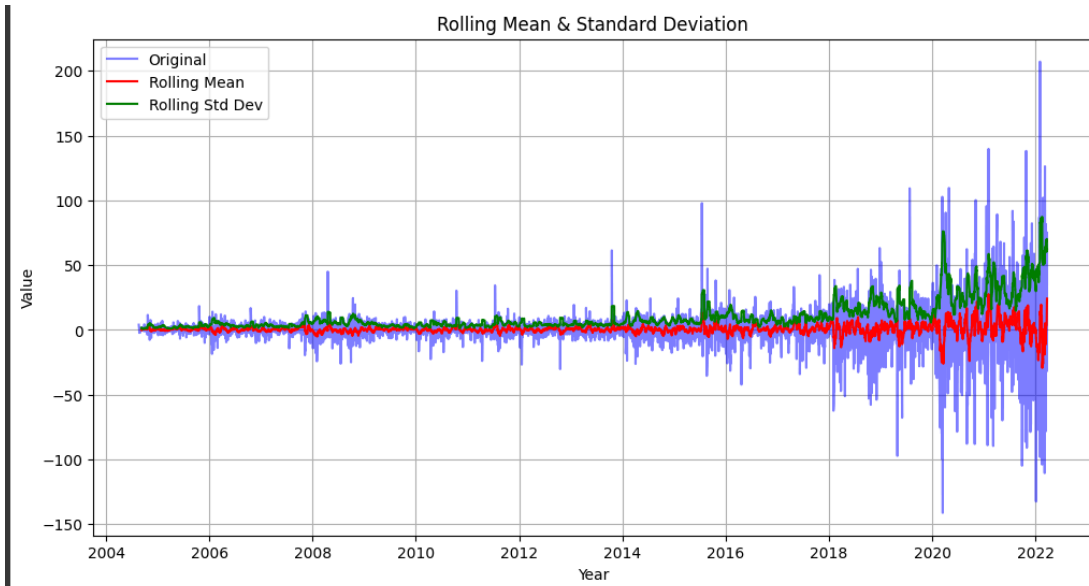
df['Close_Diff'] = df['Close'].diff() # First-order differencing
df_diff = df['Close_Diff'].dropna() # Remove NaN values

```



Step 5: Recheck for Stationarity

```
df['Close_Diff2'] = df['Close_Diff'].diff()  
test_stationarity(df['Close_Diff2'].dropna())
```



```
Results of Augmented Dickey-Fuller Test:  
Test Statistic      -1.372710e+01  
p-value             1.158566e-25  
# Lags Used         2.600000e+01  
# Observations Used 4.403000e+03  
Critical Value (1%) -3.431836e+00  
Critical Value (5%) -2.862197e+00  
Critical Value (10%) -2.567120e+00
```

RESULT:

Thus the check stationarity of time series data is done successfully