EX:No.3 DATE:28/02/25	**Develop a linear regression model for forecasting time series data**

AIM:

To develop a Linear Regression model for forecasting time series data by leveraging lag features to predict future values.

ALGORITHM:

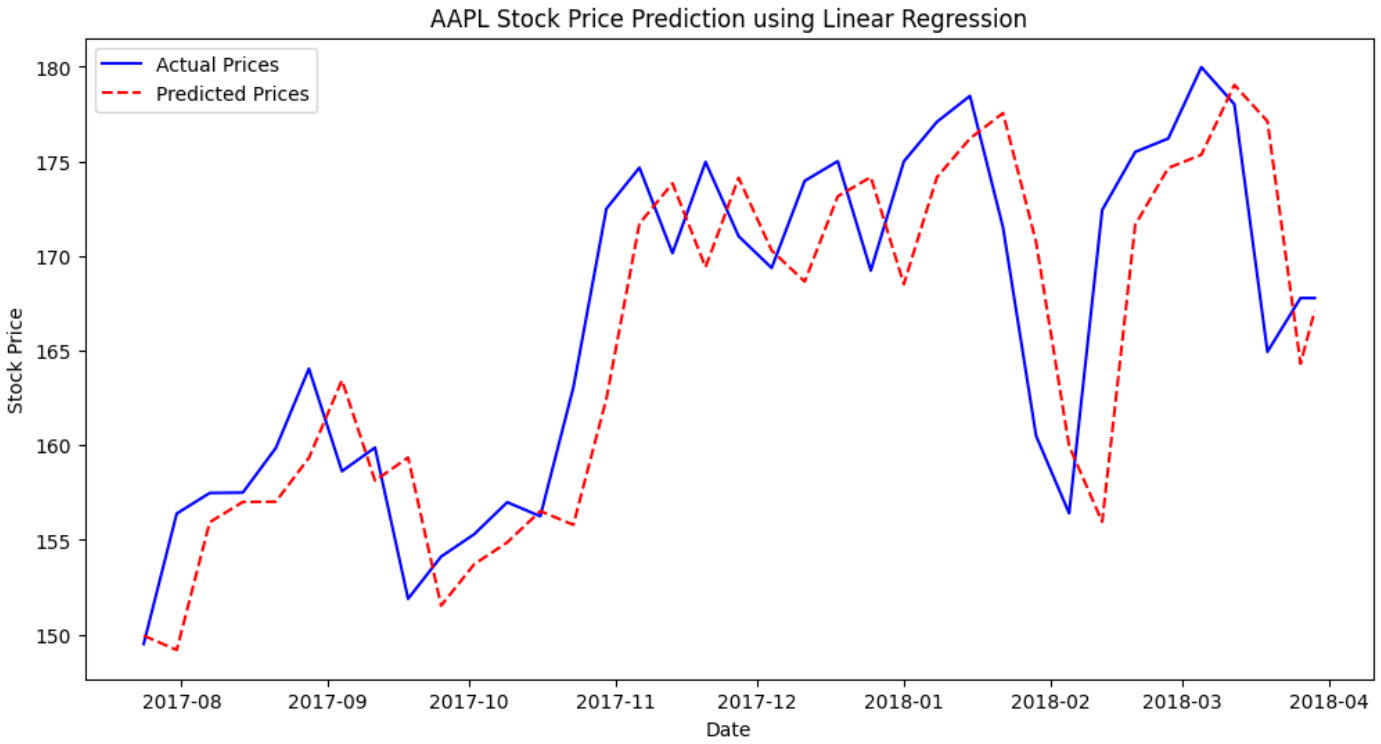
1. Load Data – Read the dataset and set the 'Date' column as the index.
2. Feature Engineering – Create lag features (Lag_1, Lag_2, etc.) from the 'Close' price.
3. Handle Missing Values – Remove NaN values created by lagging.
4. Split Data – Divide into training (80%) and testing (20%) sets.
5. Train Model – Fit a Linear Regression model using lag features as predictors.
6. Make Predictions – Use the trained model to forecast future stock prices.
7. Evaluate & Visualize – Compute MAE, MSE, R^2 score and plot actual vs. predicted values.

CODE:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
# Load the dataset
file_path = 'AAPL.csv'  # Replace with your dataset path
data = pd.read_csv(file_path)
# Convert 'Date' to datetime and set it as index
data['Date'] = pd.to_datetime(data['Date'])
data.set_index('Date', inplace=True)
# Selecting 'Close' price for forecasting
ts = data[['Close']]
# Create lag features for time series forecasting
ts['Lag_1'] = ts['Close'].shift(1)  # Lag of 1 day
```

```
ts.dropna(inplace=True)  # Remove NaN values from shifting
# Splitting into training and testing sets
train_size = int(len(ts) * 0.8)  # 80% training, 20% testing
train, test = ts[:train_size], ts[train_size:]
# Prepare X (features) and y (target)
X_train, y_train = train[['Lag_1']], train['Close']
X_test, y_test = test[['Lag_1']], test['Close']
# Train Linear Regression model
model = LinearRegression()
model.fit(X_train, y_train)
# Make predictions
y_pred = model.predict(X_test)
# Evaluate the model
mae = mean_absolute_error(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
# Print evaluation metrics
print(f"Mean Absolute Error (MAE): {mae:.4f}")
print(f"Mean Squared Error (MSE): {mse:.4f}")
print(f"R-squared (R²): {r2:.4f}")
# Plot actual vs. predicted values
plt.figure(figsize=(12, 6))
plt.plot(test.index, y_test, label="Actual Prices", color='blue')
plt.plot(test.index, y_pred, label="Predicted Prices", color='red', linestyle='dashed')
plt.xlabel("Date")
plt.ylabel("Stock Price")
plt.title("AAPL Stock Price Prediction using Linear Regression")
plt.legend()
plt.show()
```

OUTPUT:




```
Mean Absolute Error (MAE): 4.2930
Mean Squared Error (MSE): 30.6977
R-squared (R²): 0.5916
```

RESULT:

Thus the program has been completed and verified successfully.