Step 1: Collect Historical Forex Data

You need data for one or more currency pairs (e.g., EUR/USD, USD/INR, etc.).

Option 1: Download from Yahoo Finance

You can get free forex data using yfinance library in Python.

```
pip install yfinance

Requirement already satisfied: yfinance in
/usr/local/lib/python3.12/dist-packages (0.2.66)
Requirement already satisfied: pandas>=1.3.0 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (2.2.2)
Requirement already satisfied: numpy>=1.16.5 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (2.0.2)
Requirement already satisfied: requests>=2.31 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (2.32.4)
Requirement already satisfied: multitasking>=0.0.7 in
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Requirement already satisfied: platformdirs>=2.0.0 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (4.4.0)
Requirement already satisfied: pytz>=2022.5 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (2025.2)
Requirement already satisfied: frozendict>=2.3.4 in
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Requirement already satisfied: peewee>=3.16.2 in
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Requirement already satisfied: beautifulsoup4>=4.11.1 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (4.13.5)
Requirement already satisfied: curl_cffi>=0.7 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (0.13.0)
Requirement already satisfied: protobuf>=3.19.0 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (5.29.5)
Requirement already satisfied: websockets>=13.0 in
/usr/local/lib/python3.12/dist-packages (from yfinance) (15.0.1)
Requirement already satisfied: soupsieve>1.2 in
/usr/local/lib/python3.12/dist-packages (from beautifulsoup4>=4.11.1-
>yfinance) (2.8)
Requirement already satisfied: typing-extensions>=4.0.0 in
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>yfinance) (4.15.0)
Requirement already satisfied: cffi>=1.12.0 in
/usr/local/lib/python3.12/dist-packages (from curl_cffi>=0.7-
>yfinance) (2.0.0)
Requirement already satisfied: certifi>=2024.2.2 in
/usr/local/lib/python3.12/dist-packages (from curl_cffi>=0.7-
>yfinance) (2025.8.3)
Requirement already satisfied: python-dateutil>=2.8.2 in
/usr/local/lib/python3.12/dist-packages (from pandas>=1.3.0->yfinance)
```

```
(2.9.0.post0)
Requirement already satisfied: tzdata>=2022.7 in
/usr/local/lib/python3.12/dist-packages (from pandas>=1.3.0->yfinance)
(2025.2)
Requirement already satisfied: charset_normalizer<4,>=2 in
/usr/local/lib/python3.12/dist-packages (from requests>=2.31-
>yfinance) (3.4.3)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.12/dist-packages (from requests>=2.31-
>yfinance) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.12/dist-packages (from requests>=2.31-
>yfinance) (2.5.0)
Requirement already satisfied: pycparser in
/usr/local/lib/python3.12/dist-packages (from cffi>=1.12.0-
>curl_cffi>=0.7->yfinance) (2.23)
Requirement already satisfied: six>=1.5 in
/usr/local/lib/python3.12/dist-packages (from python-dateutil>=2.8.2-
>pandas>=1.3.0->yfinance) (1.17.0)
```

```
import yfinance as yf

# Download EUR/USD data for last 5 years (daily)
data = yf.download("EURUSD=X", start="2020-01-01", end="2025-01-01")

print(data.head())
```

```
/tmp/ipython-input-4211127512.py:4: FutureWarning: YF.download() has
changed argument auto_adjust default to True
  data = yf.download("EURUSD=X", start="2020-01-01", end="2025-01-01")
[**********************100%**********************]  1 of 1 completed

Price           Close      High       Low      Open   Volume
Ticker      EURUSD=X  EURUSD=X  EURUSD=X  EURUSD=X EURUSD=X
Date
2020-01-01  1.122083  1.122838  1.115947  1.122083        0
2020-01-02  1.122083  1.122712  1.116682  1.121894        0
2020-01-03  1.117144  1.118068  1.112570  1.117081        0
2020-01-06  1.116196  1.120825  1.115810  1.116246        0
2020-01-07  1.119799  1.119946  1.113487  1.119583        0
```

Step 2: Data Preprocessing

This step is all about cleaning and preparing your forex dataset before feeding it into a machine learning model.

Step 2.1 — Check for Missing or Invalid Values

```
# Check if there are any missing values
print(data.isnull().sum())

# Drop missing rows if any
data = data.dropna()

# Confirm cleaning
print("After cleaning:", data.shape)
```

```
Price   Ticker
Close   EURUSD=X    0
High    EURUSD=X    0
Low     EURUSD=X    0
Open    EURUSD=X    0
Volume  EURUSD=X    0
dtype: int64
After cleaning: (1305, 5)
```

 Step 2.2 — Convert Date Index (if not already)

Sometimes the Date column is in the index.

```
# Reset index to make 'Date' a normal column
data = data.reset_index()
print(data.head())
```

```
Price        Date     Close      High       Low      Open   Volume
Ticker                EURUSD=X  EURUSD=X  EURUSD=X  EURUSD=X EURUSD=X
0      2020-01-01  1.122083  1.122838  1.115947  1.122083        0
1      2020-01-02  1.122083  1.122712  1.116682  1.121894        0
2      2020-01-03  1.117144  1.118068  1.112570  1.117081        0
3      2020-01-06  1.116196  1.120825  1.115810  1.116246        0
4      2020-01-07  1.119799  1.119946  1.113487  1.119583        0
```

 Step 2.3 — Keep Only the Needed Columns

For our first model, we'll use Close price only (simplest approach).

```
# Select only the 'Date' and 'Close' columns
data = data[['Date', 'Close']]
```

⚙ Step 2.4 — Create Features and Targets

We need to turn this time-series into a supervised learning dataset.

We'll predict tomorrow's price using the previous 5 days.

```
import pandas as pd

# Create lag features (previous 5 days)
```

```
for i in range(1, 6):
    data[f'lag_{i}'] = data['Close'].shift(i)

# Drop missing rows after shifting
data = data.dropna()

# Target: next day's close price
X = data[['lag_1', 'lag_2', 'lag_3', 'lag_4', 'lag_5']]
y = data['Close']
```

 Step 2.5 — Train/Test Split

We'll split the data to train and test your model later.

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, shuffle=False)
```

Step 3: Model Building (Linear Regression)

 Step 3.1 — Import Libraries

```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
import numpy as np
```

 Step 3.2 — Create and Train the Model

```
# Initialize the Linear Regression model
model = LinearRegression()

# Train the model
model.fit(X_train, y_train)
```

```
LinearRegression()
```

 Step 3.3 — Make Predictions

```
# Predict on test data
y_pred = model.predict(X_test)
```

 Step 3.4 — Evaluate the Model

```
# Calculate RMSE and R^2 score
rmse = np.sqrt(mean_squared_error(y_test, y_pred))
r2 = r2_score(y_test, y_pred)
```

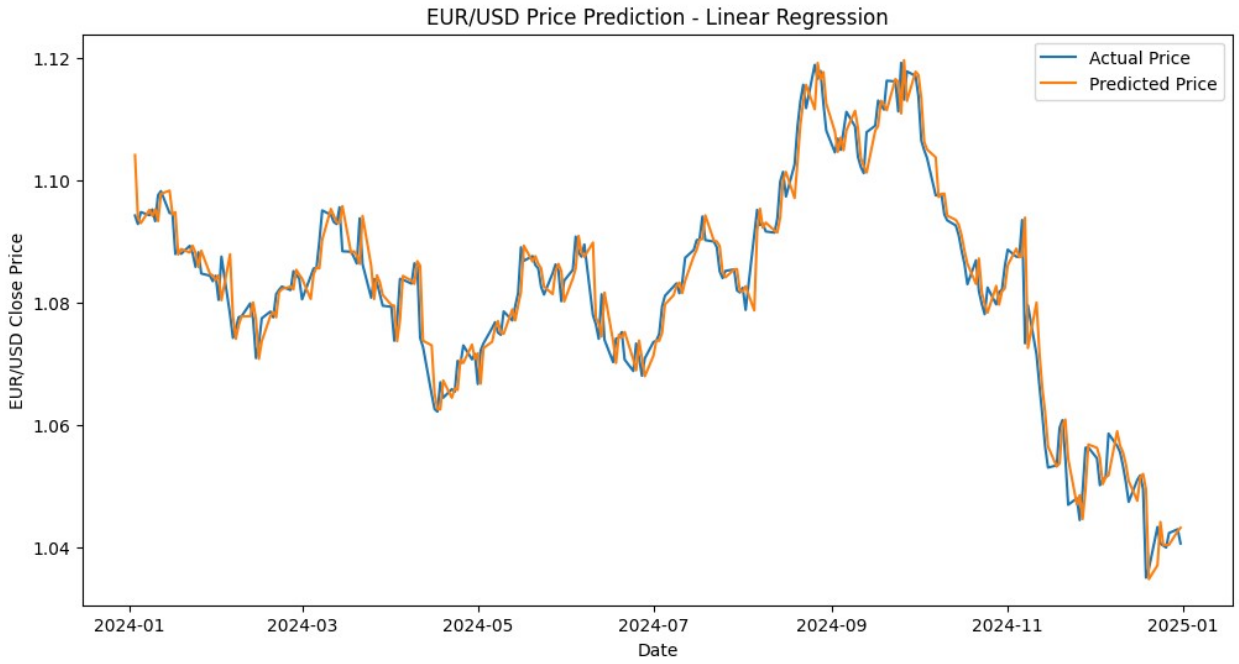
```
print(f"RMSE: {rmse}")
print(f"R^2 Score: {r2}")

RMSE: 0.004014020749912682
R^2 Score: 0.9481123254970558
```

 Step 3.5 — Plot Predictions vs Actual Prices

```
import matplotlib.pyplot as plt

plt.figure(figsize=(12,6))
plt.plot(data['Date'].iloc[-len(y_test):], y_test, label='Actual
Price')
plt.plot(data['Date'].iloc[-len(y_test):], y_pred, label='Predicted
Price')
plt.xlabel('Date')
plt.ylabel('EUR/USD Close Price')
plt.title('EUR/USD Price Prediction - Linear Regression')
plt.legend()
plt.show()
```



Step 4: LSTM Model for Forex Prediction

 Step 4.1 — Install Libraries

```
pip install tensorflow

Requirement already satisfied: tensorflow in
/usr/local/lib/python3.12/dist-packages (2.19.0)
```

```
Requirement already satisfied: absl-py>=1.0.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=24.3.25 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (25.9.23)
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1
in /usr/local/lib/python3.12/dist-packages (from tensorflow) (0.6.0)
Requirement already satisfied: google-pasta>=0.1.1 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: libclang>=13.0.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (18.1.1)
Requirement already satisfied: opt-einsum>=2.3.2 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (3.4.0)
Requirement already satisfied: packaging in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (25.0)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!
=4.21.3,!=4.21.4,!=4.21.5,<6.0.0dev,>=3.20.3 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (5.29.5)
Requirement already satisfied: requests<3,>=2.21.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (2.32.4)
Requirement already satisfied: setuptools in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (75.2.0)
Requirement already satisfied: six>=1.12.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (1.17.0)
Requirement already satisfied: termcolor>=1.1.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (3.1.0)
Requirement already satisfied: typing-extensions>=3.6.6 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (4.15.0)
Requirement already satisfied: wrapt>=1.11.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (1.17.3)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (1.75.1)
Requirement already satisfied: tensorboard~=2.19.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (2.19.0)
Requirement already satisfied: keras>=3.5.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (3.10.0)
Requirement already satisfied: numpy<2.2.0,>=1.26.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (2.0.2)
Requirement already satisfied: h5py>=3.11.0 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (3.14.0)
Requirement already satisfied: ml-dtypes<1.0.0,>=0.5.1 in
/usr/local/lib/python3.12/dist-packages (from tensorflow) (0.5.3)
Requirement already satisfied: wheel<1.0,>=0.23.0 in
/usr/local/lib/python3.12/dist-packages (from astunparse>=1.6.0-
>tensorflow) (0.45.1)
Requirement already satisfied: rich in /usr/local/lib/python3.12/dist-
packages (from keras>=3.5.0->tensorflow) (13.9.4)
Requirement already satisfied: namex in
```

```
/usr/local/lib/python3.12/dist-packages (from keras>=3.5.0-
>tensorflow) (0.1.0)
Requirement already satisfied: optree in
/usr/local/lib/python3.12/dist-packages (from keras>=3.5.0-
>tensorflow) (0.17.0)
Requirement already satisfied: charset_normalizer<4,>=2 in
/usr/local/lib/python3.12/dist-packages (from requests<3,>=2.21.0-
>tensorflow) (3.4.3)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.12/dist-packages (from requests<3,>=2.21.0-
>tensorflow) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.12/dist-packages (from requests<3,>=2.21.0-
>tensorflow) (2.5.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.12/dist-packages (from requests<3,>=2.21.0-
>tensorflow) (2025.8.3)
Requirement already satisfied: markdown>=2.6.8 in
/usr/local/lib/python3.12/dist-packages (from tensorboard~=2.19.0-
>tensorflow) (3.9)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0
in /usr/local/lib/python3.12/dist-packages (from tensorboard~=2.19.0-
>tensorflow) (0.7.2)
Requirement already satisfied: werkzeug>=1.0.1 in
/usr/local/lib/python3.12/dist-packages (from tensorboard~=2.19.0-
>tensorflow) (3.1.3)
Requirement already satisfied: MarkupSafe>=2.1.1 in
/usr/local/lib/python3.12/dist-packages (from werkzeug>=1.0.1-
>tensorboard~=2.19.0->tensorflow) (3.0.3)
Requirement already satisfied: markdown-it-py>=2.2.0 in
/usr/local/lib/python3.12/dist-packages (from rich->keras>=3.5.0-
>tensorflow) (4.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in
/usr/local/lib/python3.12/dist-packages (from rich->keras>=3.5.0-
>tensorflow) (2.19.2)
Requirement already satisfied: mdurl~=0.1 in
/usr/local/lib/python3.12/dist-packages (from markdown-it-py>=2.2.0-
>rich->keras>=3.5.0->tensorflow) (0.1.2)
```

 Step 4.2 — Import Libraries

```
import numpy as np
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import LSTM, Dense, Dropout
import matplotlib.pyplot as plt
```

 Step 4.3 — Prepare Data for LSTM

LSTM works best with normalized data and 3D input: (samples, timesteps, features).

```
# Use 'Close' price only
data_lstm = data[['Close']].values

# Normalize data between 0 and 1
scaler = MinMaxScaler(feature_range=(0,1))
data_scaled = scaler.fit_transform(data_lstm)

# Create sequences (lookback = 60 days)
X_lstm = []
y_lstm = []

lookback = 60

for i in range(lookback, len(data_scaled)):
    X_lstm.append(data_scaled[i-lookback:i, 0])
    y_lstm.append(data_scaled[i, 0])

X_lstm, y_lstm = np.array(X_lstm), np.array(y_lstm)

# Reshape for LSTM (samples, timesteps, features)
X_lstm = np.reshape(X_lstm, (X_lstm.shape[0], X_lstm.shape[1], 1))

# Split into train/test (80/20)
split = int(0.8 * len(X_lstm))
X_train, X_test = X_lstm[:split], X_lstm[split:]
y_train, y_test = y_lstm[:split], y_lstm[split:]

 Step 4.4 – Build LSTM Model

model = Sequential()

# First LSTM layer
model.add(LSTM(units=50, return_sequences=True,
input_shape=(X_train.shape[1], 1)))
model.add(Dropout(0.2))

# Second LSTM layer
model.add(LSTM(units=50, return_sequences=False))
model.add(Dropout(0.2))

# Output layer
model.add(Dense(units=1))

# Compile model
model.compile(optimizer='adam', loss='mean_squared_error')

# Train model
history = model.fit(X_train, y_train, epochs=20, batch_size=32,
validation_split=0.1)
```

```
Epoch 1/20

/usr/local/lib/python3.12/dist-packages/keras/src/layers/rnn/
rnn.py:199: UserWarning: Do not pass an `input_shape`/`input_dim`
argument to a layer. When using Sequential models, prefer using an
`Input(shape)` object as the first layer in the model instead.
  super().__init__(**kwargs)

28/28 ━━━━━━━━━━━━━━━━━━━━ 8s 101ms/step - loss: 0.1371 - val_loss:
0.0024
Epoch 2/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 4s 152ms/step - loss: 0.0110 - val_loss:
0.0027
Epoch 3/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 3s 64ms/step - loss: 0.0071 - val_loss:
0.0014
Epoch 4/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 49ms/step - loss: 0.0055 - val_loss:
0.0014
Epoch 5/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 3s 50ms/step - loss: 0.0059 - val_loss:
0.0018
Epoch 6/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 50ms/step - loss: 0.0056 - val_loss:
0.0013
Epoch 7/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 77ms/step - loss: 0.0052 - val_loss:
0.0013
Epoch 8/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 54ms/step - loss: 0.0046 - val_loss:
0.0012
Epoch 9/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 50ms/step - loss: 0.0048 - val_loss:
0.0012
Epoch 10/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 50ms/step - loss: 0.0047 - val_loss:
0.0012
Epoch 11/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 3s 50ms/step - loss: 0.0046 - val_loss:
0.0013
Epoch 12/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 50ms/step - loss: 0.0041 - val_loss:
0.0014
Epoch 13/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 63ms/step - loss: 0.0044 - val_loss:
0.0011
Epoch 14/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 80ms/step - loss: 0.0041 - val_loss:
0.0011
Epoch 15/20
```

```
28/28 ━━━━━━━━━━━━━━━━━━━━ 2s 50ms/step - loss: 0.0036 - val_loss:
0.0011
Epoch 16/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 49ms/step - loss: 0.0040 - val_loss:
0.0011
Epoch 17/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 50ms/step - loss: 0.0035 - val_loss:
0.0011
Epoch 18/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 51ms/step - loss: 0.0037 - val_loss:
0.0012
Epoch 19/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 1s 50ms/step - loss: 0.0036 - val_loss:
0.0011
Epoch 20/20
28/28 ━━━━━━━━━━━━━━━━━━━━ 3s 55ms/step - loss: 0.0040 - val_loss:
0.0010
```

 Step 4.5 — Predict and Inverse Transform

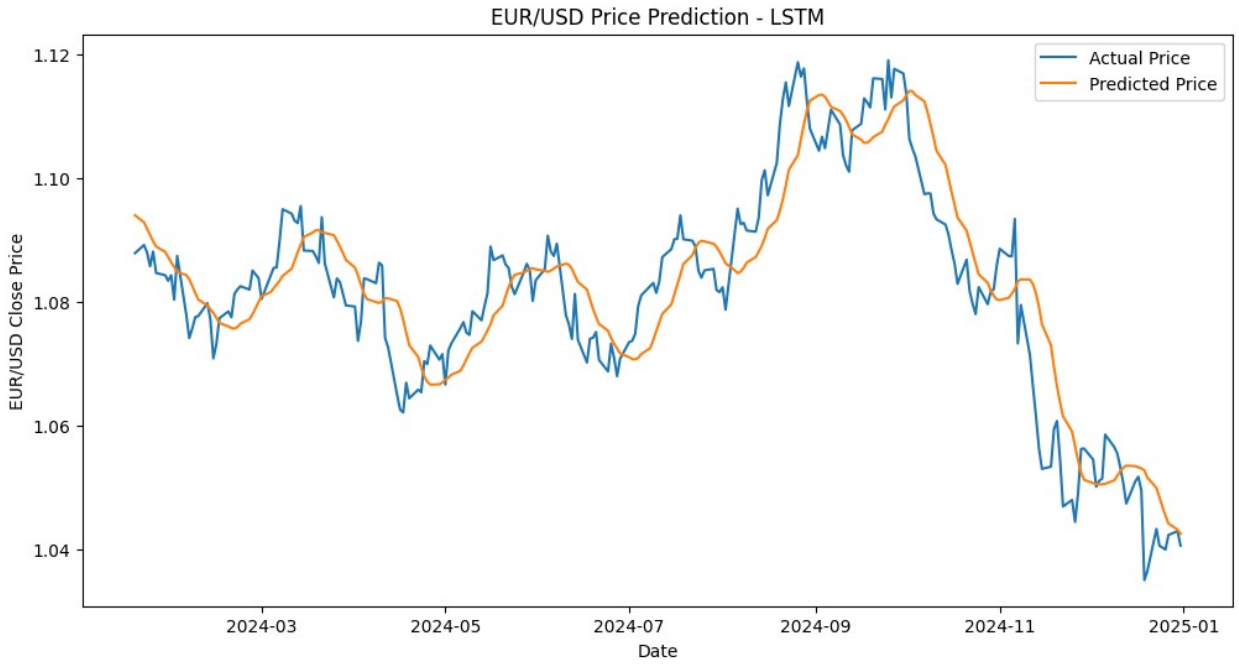
```
# Make predictions
y_pred = model.predict(X_test)

# Reverse scaling
y_pred_scaled = scaler.inverse_transform(y_pred.reshape(-1,1))
y_test_scaled = scaler.inverse_transform(y_test.reshape(-1,1))
```

```
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 52ms/step
```

 Step 4.6 — Plot Predictions vs Actual

```
plt.figure(figsize=(12,6))
plt.plot(data['Date'].iloc[-len(y_test_scaled):], y_test_scaled,
label='Actual Price')
plt.plot(data['Date'].iloc[-len(y_test_scaled):], y_pred_scaled,
label='Predicted Price')
plt.xlabel('Date')
plt.ylabel('EUR/USD Close Price')
plt.title('EUR/USD Price Prediction - LSTM')
plt.legend()
plt.show()
```



Step 5: Trading Strategy & Backtesting

We'll use a simple strategy first:

Buy if the model predicts the next day's price will go up

Sell if the model predicts the next day's price will go down

```
# Create a DataFrame for test results
results = pd.DataFrame({
    'Date': data['Date'].iloc[-len(y_test_scaled):].values,
    'Actual': y_test_scaled.flatten(),
    'Predicted': y_pred_scaled.flatten()
})

# Generate signals: 1 = Buy, -1 = Sell
results['Signal'] = 0
results.loc[results['Predicted'] > results['Actual'], 'Signal'] = 1
results.loc[results['Predicted'] < results['Actual'], 'Signal'] = -1

print(results.head(10))
```

```
        Date    Actual  Predicted  Signal
0 2024-01-19  1.087914   1.094032       1
1 2024-01-22  1.089230   1.092892       1
2 2024-01-23  1.088021   1.091844       1
3 2024-01-24  1.085788   1.090853       1
4 2024-01-25  1.088175   1.089836       1
5 2024-01-26  1.084705   1.088993       1
6 2024-01-29  1.084352   1.088128       1
```

```
7 2024-01-30  1.083447   1.087278       1
8 2024-01-31  1.084340   1.086435       1
9 2024-02-01  1.080392   1.085697       1
```

 Step 5.2 — Calculate Returns

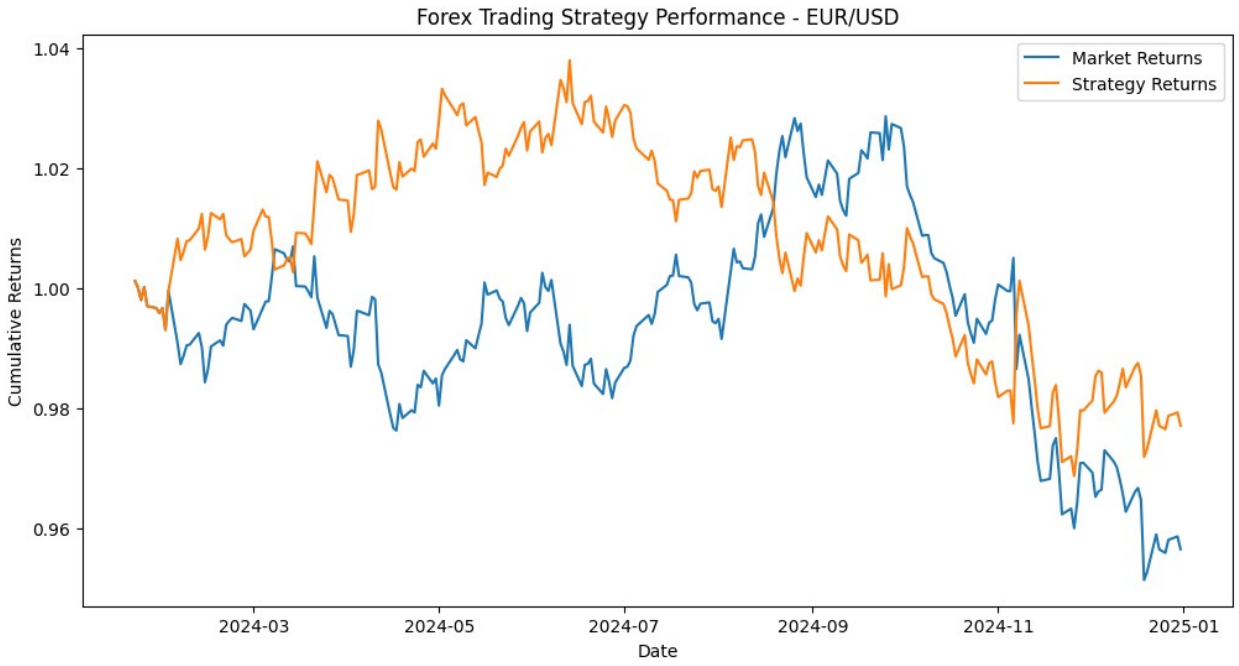
```
# Calculate daily returns
results['Return'] = results['Actual'].pct_change()

# Strategy returns
results['Strategy_Return'] = results['Return'] *
results['Signal'].shift(1)

# Cumulative returns
results['Cumulative_Market'] = (1 + results['Return']).cumprod()
results['Cumulative_Strategy'] = (1 +
results['Strategy_Return']).cumprod()
```

 Step 5.3 — Plot Strategy Performance

```
plt.figure(figsize=(12,6))
plt.plot(results['Date'], results['Cumulative_Market'], label='Market
Returns')
plt.plot(results['Date'], results['Cumulative_Strategy'],
label='Strategy Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')
plt.title('Forex Trading Strategy Performance - EUR/USD')
plt.legend()
plt.show()
```



 Step 5.4 — Evaluate Performance

```
total_return = results['Cumulative_Strategy'].iloc[-1] - 1
market_return = results['Cumulative_Market'].iloc[-1] - 1

print(f"Strategy Total Return: {total_return*100:.2f}%")
print(f"Market Total Return: {market_return*100:.2f}%")
```

```
Strategy Total Return: -2.29%
Market Total Return: -4.35%
```