## EXERCISE NO 09

## Develop Neural Network Based Time Series Forecasting Model

**AIM:**

To develop a neural network based time series forecasting model.

**PROCEDURE:**

1. **Import the necessary libraries.**

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

2. **Load the time series data.**

   ```
   df = pd.read_csv(“.../amazon.csv”, encoding = “latin1”)
   ```

3. **Pre-process the data.**

   ```
   month_map = {
     'Janeiro': 'January', 'Fevereiro': 'February', 'Março': 'March',
     'Abril': 'April', 'Maio': 'May', 'Junho': 'June',
     'Julho': 'July', 'Agosto': 'August', 'Setembro': 'September',
     'Outubro': 'October', 'Novembro': 'November', 'Dezembro': 'December'
   }
   ```

```
df['month'] = df['month'].map(month_map)

df['date'] = pd.to_datetime(df['month'] + ' ' + df['year'].astype(str),
format='%B %Y')

df.set_index('date', inplace=True)
```

4. **Scale the data**

```
scaler = MinMaxScaler()

data = scaler.fit_transform(df_monthly.values.reshape(-1, 1))
```

5. **Create sequences**

```
X, y = [], []

for i in range(12, len(data)):

    X.append(data[i-12:i])

    y.append(data[i])

X, y = np.array(X), np.array(y)
```

6. **Define and train model**

```
model = Sequential([

    LSTM(50, input_shape=(12, 1)),

    Dense(1)

])

model.compile(optimizer='adam', loss='mse')

model.fit(X, y, epochs=20, verbose=1)
```

7. **Visualise the forecasting**

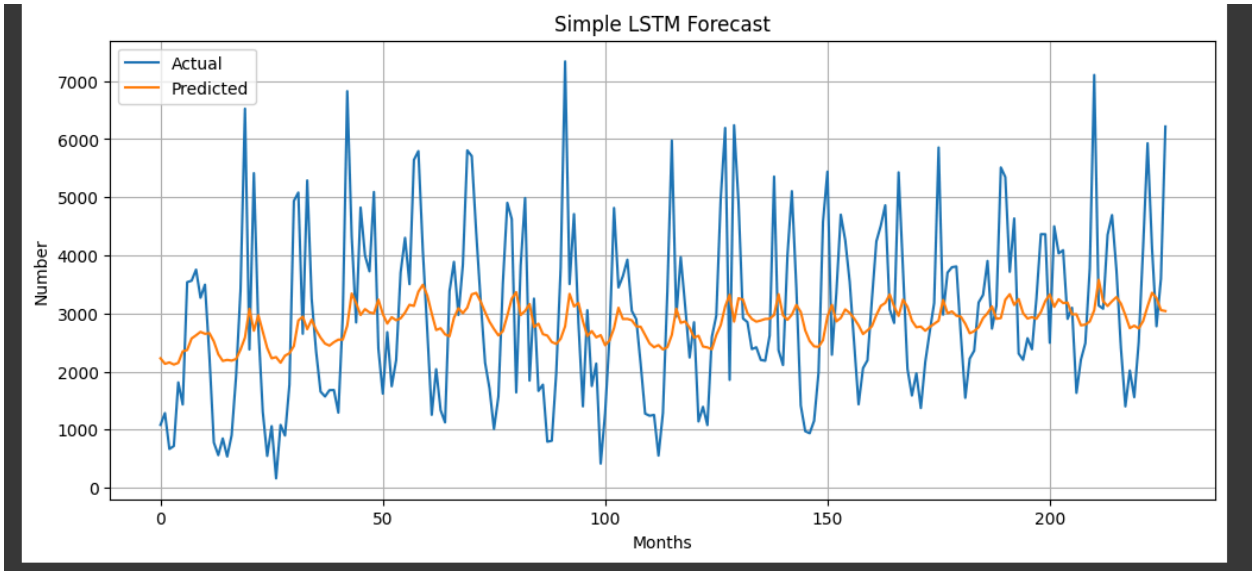
```
plt.plot(actual, label='Actual')

plt.plot(pred, label='Predicted')

plt.legend()
```

```
plt.title('Simple LSTM Forecast')
plt.show()
```

**OUTPUT:**




**RESULT:**

Thus the program has been successfully implemented and verified.