8. Create an ARIMA model for time series forecasting.

AIM:

To implement an **ARIMA (AutoRegressive Integrated Moving Average)** model to forecast future values in a time series dataset of daily expenses.

PROCEDURE:

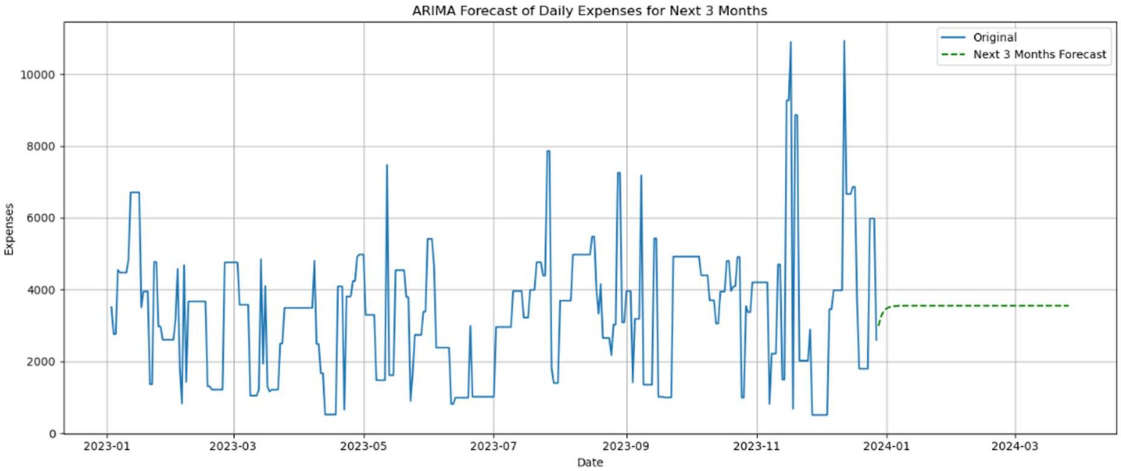
1) **Load and preprocess** the time series data.
2) **Convert the date column** to datetime and aggregate daily expenses.
3) **Fill missing dates** and apply **forward-fill** to maintain continuity.
4) **Choose ARIMA model order** (p, d, q) where:
5) p: Number of lag observations (AR term)
6) d: Degree of differencing
7) q: Size of the moving average window
8) **Fit the ARIMA model** on the data.
9) **Forecast** future values (e.g., next 10 days).
10) **Visualize** the original series with the forecast.

CODE:

```
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.arima.model import ARIMA
from pandas.plotting import register_matplotlib_converters

register_matplotlib_converters()

# Step 1: Load data
data = pd.read_csv('/mnt/data/expenses.csv')
data['date'] = pd.to_datetime(data['date'])

# Step 2: Aggregate daily expenses
daily_expenses = data.groupby('date')['amount'].sum().reset_index()
```

```
daily_expenses.sort_values('date', inplace=True)
daily_expenses.set_index('date', inplace=True)

# Step 3: Fill missing dates
daily_expenses = daily_expenses.asfreq('D')
daily_expenses['amount'] = daily_expenses['amount'].fillna(method='ffill')

# Step 4: Fit ARIMA model
ts_data = daily_expenses['amount']
model = ARIMA(ts_data, order=(1, 1, 1))  # You can experiment with (p,d,q)
model_fit = model.fit()

# Step 5: Forecast next 10 days
forecast = model_fit.forecast(steps=10)

# Step 6: Plot
plt.figure(figsize=(12, 6))
plt.plot(ts_data, label='Original')
plt.plot(pd.date_range(ts_data.index[-1] + pd.Timedelta(days=1), periods=10, freq='D'),
         forecast, label='Forecast', marker='o', color='orange')
plt.title('ARIMA Forecast of Daily Expenses')
plt.xlabel('Date')
plt.ylabel('Expenses')
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()
```

OUTPUT:



RESULT:

The program to ARIMA model is implemented successfully.