8. Create an ARIMA model for time series forecasting.

EX.N0 : 8	**Create an ARIMA model for time series forecasting.**
DATE : 07/04/2025	

AIM:

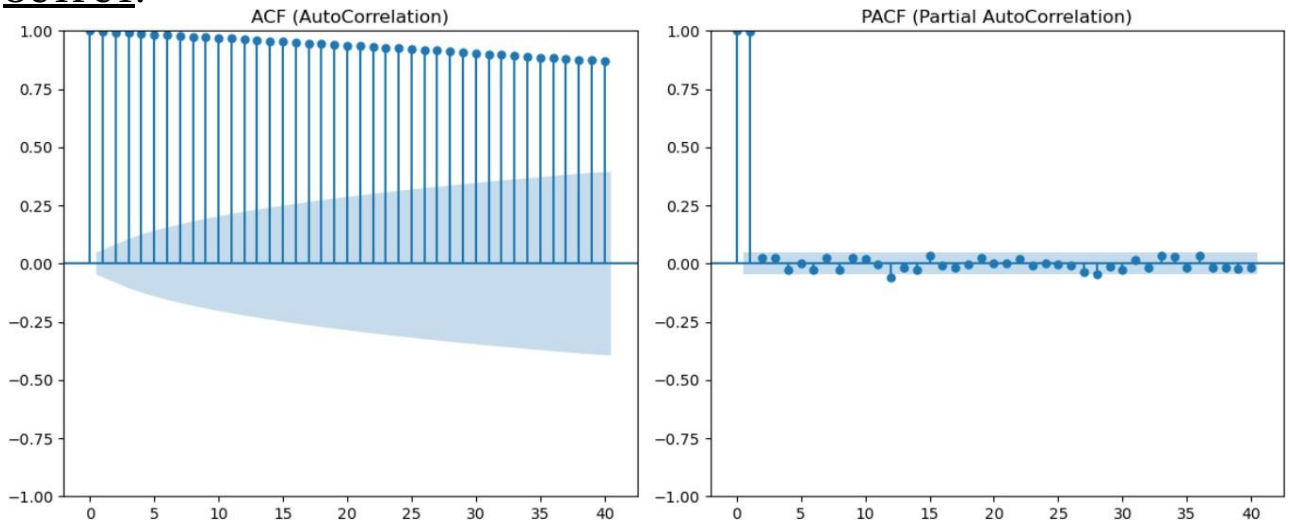
To Create an ARIMA model for time series forecasting.

PROGRAM:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")

from statsmodels.tsa.arima.model import ARIMA
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf

file_path = r"D:/221501507/TIME SERIES ANALYSIS AND FORECASTING/EX06/archive (1)
(1)/FINAL_USO.csv"
df = pd.read_csv(file_path, parse_dates=["Date"], index_col="Date")
df.columns = df.columns.str.strip()

target_col = "Adj Close"
if target_col not in df.columns:
    raise ValueError(f"'{target_col}' column not found in dataset.")

ts = df[target_col].dropna()

plt.figure(figsize=(12, 5))
plt.subplot(1, 2, 1)
plot_acf(ts, ax=plt.gca(), lags=40)
plt.title("ACF (AutoCorrelation)")

plt.subplot(1, 2, 2)
plot_pacf(ts, ax=plt.gca(), lags=40)
plt.title("PACF (Partial AutoCorrelation)")
plt.tight_layout()
plt.show()

model = ARIMA(ts, order=(5, 1, 2))  # ARIMA(p,d,q)
model_fit = model.fit()

print("\n ARIMA Model Summary:")
```

```
print(model_fit.summary())

forecast_steps = 30  # Days ahead
forecast = model_fit.forecast(steps=forecast_steps)

plt.figure(figsize=(12, 6))
plt.plot(ts, label='Actual', color='blue')
plt.plot(forecast.index, forecast, label='Forecast', color='red')
plt.title("ARIMA Forecast of Gold Price (Adj Close)")
plt.xlabel("Date")
plt.ylabel("Price")
plt.legend()
plt.grid(True)
plt.show()
```

OUTPUT:



SARIMAX Results

Dep. Variable:	Adj Close	No. Observations:	1718
Model:	ARIMA(5, 1, 2)	Log Likelihood	-2819.198
Date:	Sat, 12 Apr 2025	AIC	5654.396
Time:	12:06:14	BIC	5697.982
Sample:	0	HQIC	5670.524
	- 1718		
Covariance Type:	opg		

	coef	std err	z	P>|z|	[0.025	0.975]
ar.L1	-0.3127	0.498	-0.628	0.530	-1.289	0.664
ar.L2	0.5132	0.489	1.049	0.294	-0.446	1.472
ar.L3	0.0341	0.052	0.650	0.516	-0.069	0.137
ar.L4	0.0141	0.024	0.578	0.563	-0.034	0.062
ar.L5	0.0322	0.026	1.231	0.219	-0.019	0.083
ma.L1	0.2537	0.499	0.509	0.611	-0.724	1.231
ma.L2	-0.5627	0.461	-1.220	0.222	-1.467	0.341
sigma2	1.5620	0.024	66.248	0.000	1.516	1.608

Ljung-Box (L1) (Q):	0.00	Jarque-Bera (JB):	9846.34
Prob(Q):	1.00	Prob(JB):	0.00
Heteroskedasticity (H):	0.22	Skew:	-0.68
Prob(H) (two-sided):	0.00	Kurtosis:	14.65

RESULT:

Thus, the program for Create an ARIMA model for time series forecasting is executed successfully.