Time series with python

Teacher : Dr.Karimi

Student : Amirhossien Arab

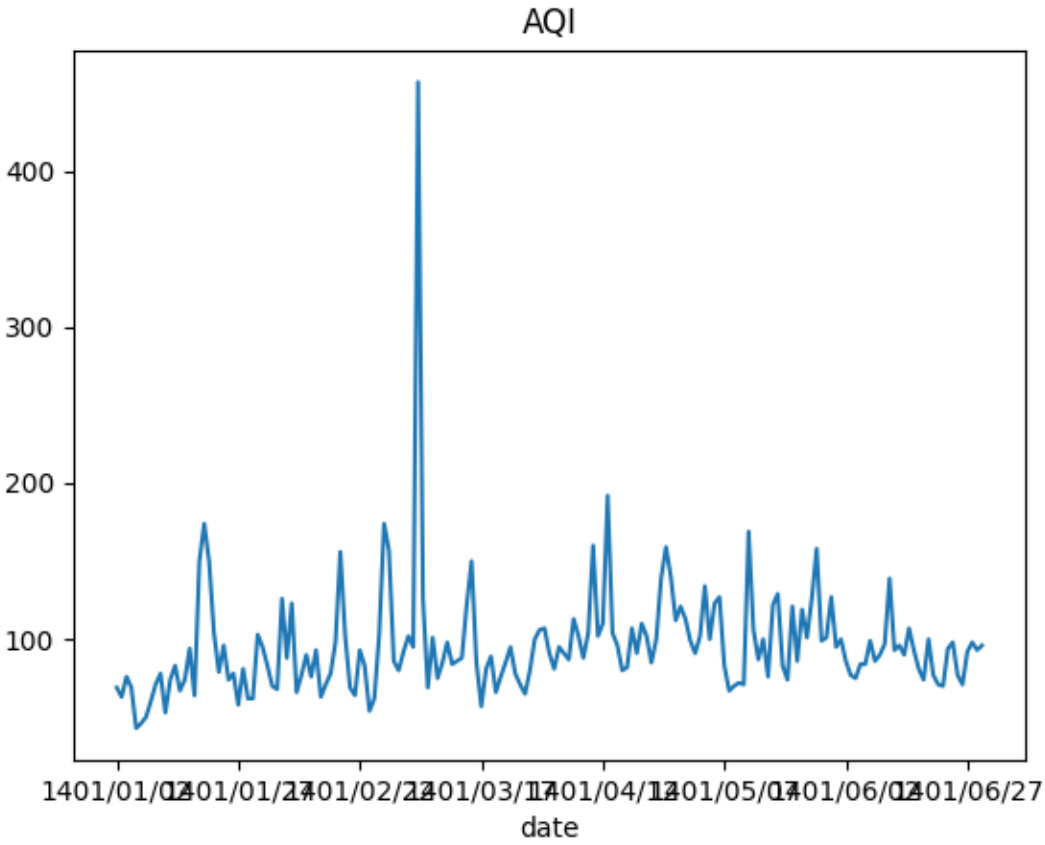
9721350001

```
>>> import pandas as pd
>>> import numpy as np
>>> import matplotlib.pyplot as plt
>>> from datetime import datetime
>>> from datetime import timedelta
>>> from statsmodels.tsa.stattools import acf, pacf
>>> from statsmodels.tsa.statespace.sarimax import SARIMAX
>>> from time import time
>>> #######
>>> import pandas as pd
>>> import numpy as np          # For mathematical calculations
>>> import matplotlib.pyplot as plt  # For plotting graphs
>>> from datetime import datetime    # To access datetime
>>> from pandas import Series        # To work on series
>>> import warnings                  # To ignore the warnings
>>> import os
>>> from scipy.stats import norm
>>> from statsmodels.tsa.arima_model import ARMA
>>> from statsmodels.tsa.stattools import adfuller
>>> from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
>>> from statsmodels.tsa.arima_process import ArmaProcess
>>> from statsmodels.tsa.arima_model import ARIMA
>>> import math
>>> from sklearn.metrics import mean_squared_error
>>> import statsmodels.api as sm
```

```
>>> from numpy.random import normal, seed
>>> from scipy.stats import norm
>>> from statsmodels.tsa.arima_model import ARMA
>>> from statsmodels.tsa.stattools import adfuller
>>> from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
>>> from statsmodels.tsa.arima_process import ArmaProcess
>>> from statsmodels.tsa.arima_model import ARIMA
>>> import math
>>> ##############
>>> humidity = pd.read_csv('C:/Users/BEHINLAPTOP/Desktop/11.csv',
index_col='date', parse_dates=['date'])
FileNotFoundError: [Errno 2] No such file or directory:
'C:/Users/BEHINLAPTOP/Desktop/11.csv'
>>> humidity.head()
            AQI
date
1401/01/03   63
1401/01/04   76
1401/01/05   69
1401/01/06   43
1401/01/07   46
>>> humidity = humidity.iloc[1:]
>>> humidity = humidity.fillna(method='ffill')
>>> humidity["AQI"].plot()
<AxesSubplot: title={'center': 'AQI'}, xlabel='date'>
>>> plt.title('AQI')
```

Text(0.5, 1.0, 'AQI')

>>> plt.show()



>>> humidity["AQI"].plot(legend=True)

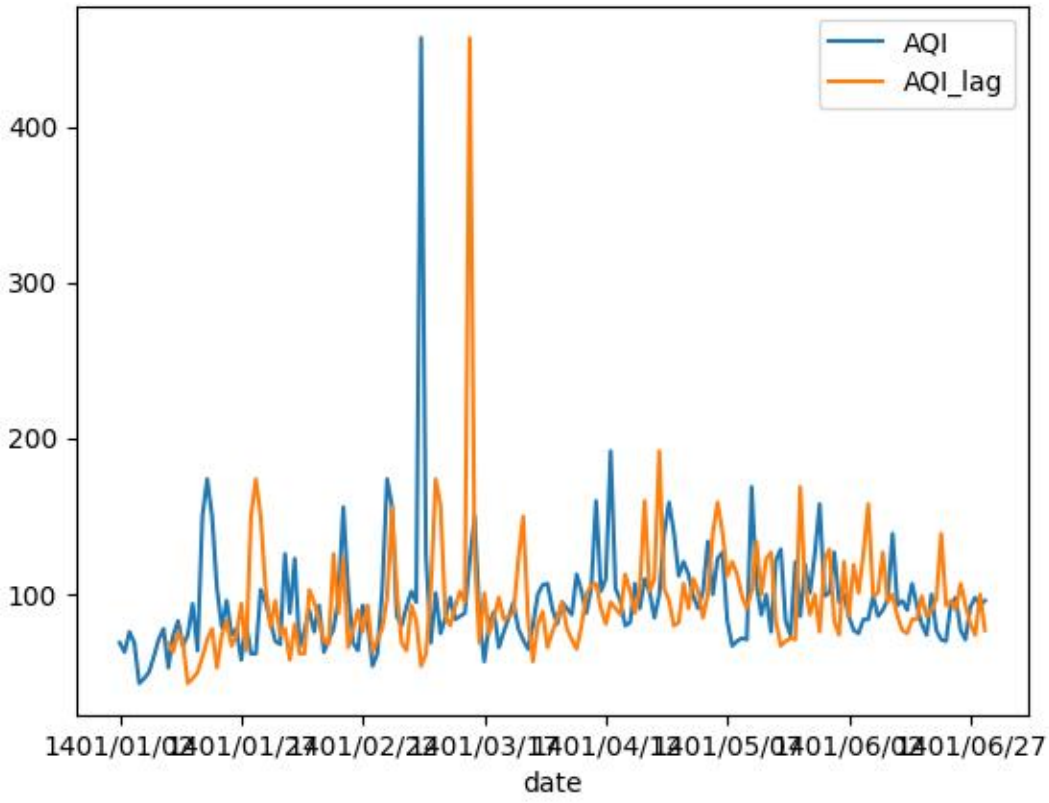
<AxesSubplot: title={'center': 'AQI'}, xlabel='date'>

>>> shifted = humidity["AQI"].shift(10).plot(legend=True)

>>> shifted.legend(['AQI','AQI_lag'])

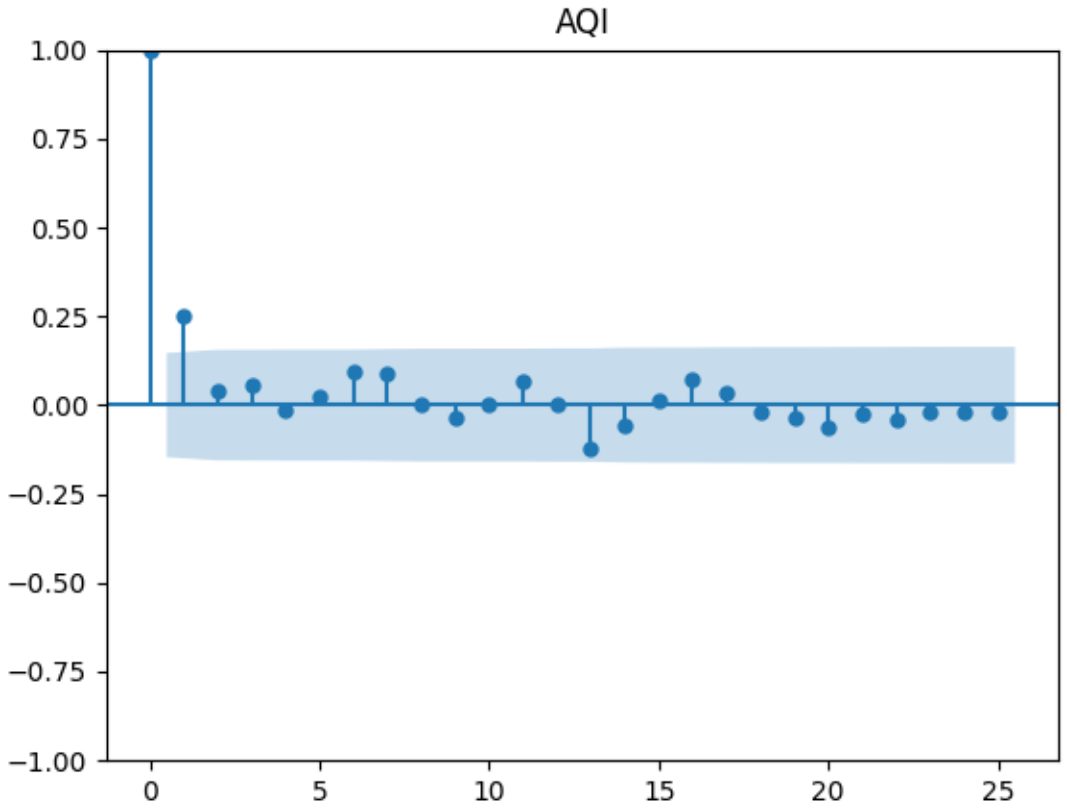
<matplotlib.legend.Legend object at 0x000001ED891C3BE0>

>>> plt.show()




```
>>> from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
>>> ##  acf
>>> plot_acf(humidity["AQI"],lags=25,title="AQI")
<Figure size 640x480 with 1 Axes>
```

>>> plt.show()

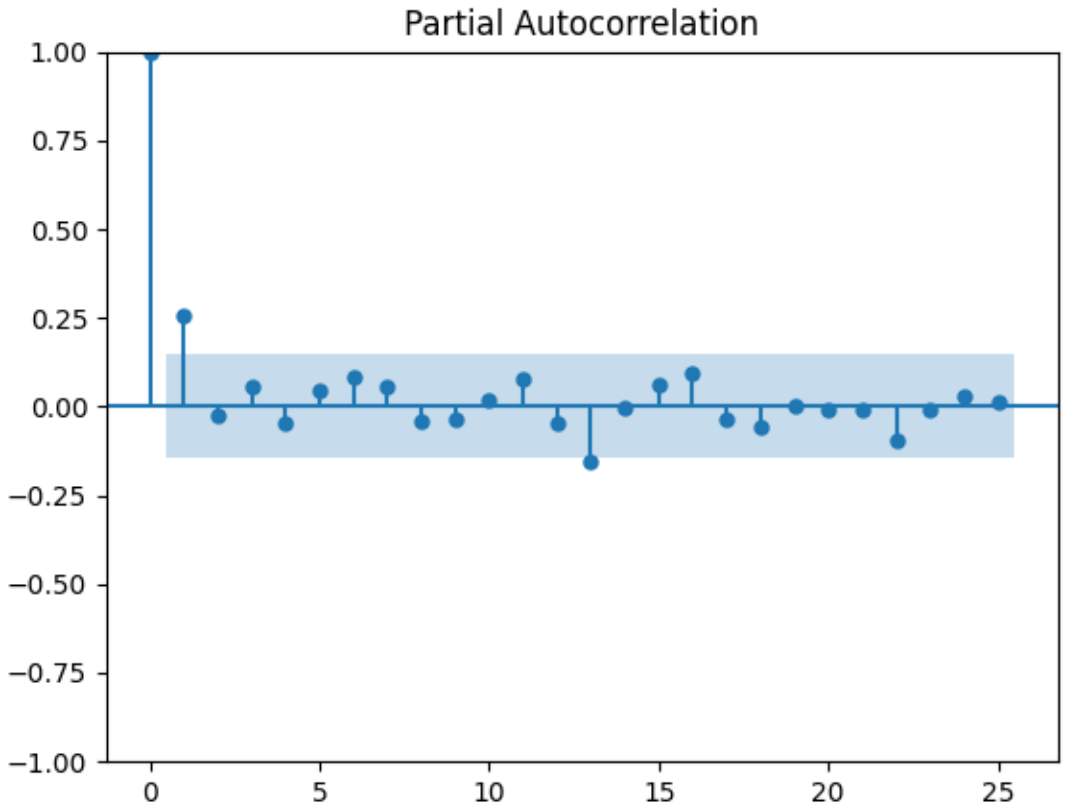


>>> ## pacf

>>> plot_pacf(humidity["AQI"],lags=25)

<Figure size 640x480 with 1 Axes>

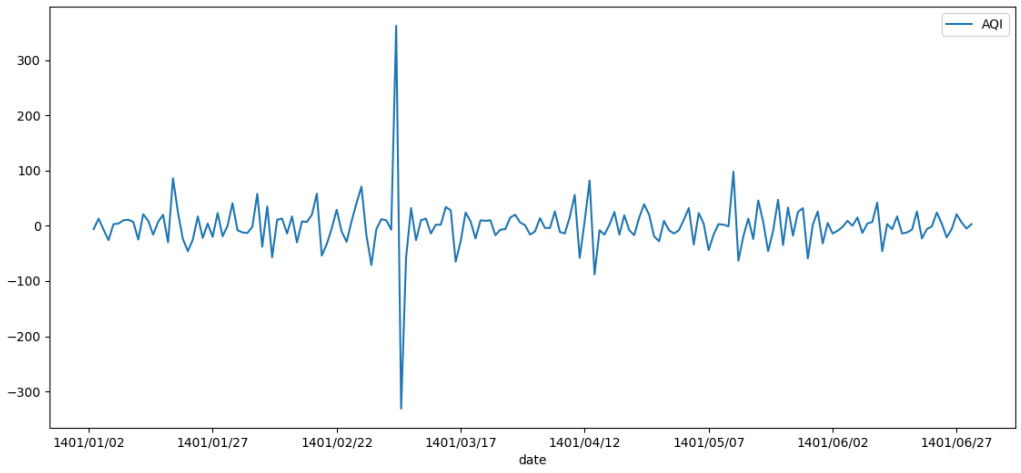
>>> plt.show()



>>> humidity.diff().plot(figsize=(20,6))

<AxesSubplot: xlabel='date'>

>>> plt.show(



```
>>> my_order = (0,1,0)
>>> my_seasonal_order = (1, 0, 1, 12)
>>> # define model
>>> train_data = humidity["AQI"]*2
>>> model = SARIMAX(train_data, order=my_order,
seasonal_order=my_seasonal_order)
>>> start = time()
>>> model_fit = model.fit()
>>> end = time()
>>> print('Model Fitting Time:', end - start)
Model Fitting Time: 1.096449375152588
>>> print(model_fit.summary())
                              SARIMAX Results
==========================================================
================================
Dep. Variable:                          AQI   No. Observations:                 177
Model:           SARIMAX(0, 1, 0)x(1, 0, [1], 12)   Log Likelihood           -
1045.770
Date:                       Fri, 30 Dec 2022   AIC                       2097.540
Time:                               19:53:18   BIC                       2107.051
Sample:                                   0   HQIC                      2101.398
                                      - 177
Covariance Type:                        opg
==========================================================
==================
                 coef    std err          z      P>|z|      [0.025      0.975]
```

---

ar.S.L12	-0.8843	0.299	-2.961	0.003	-1.470	-0.299
ma.S.L12	0.9966	4.219	0.236	0.813	-7.272	9.265
sigma2	8144.7640	3.22e+04	0.253	0.800	-5.5e+04	7.13e+04

Ljung-Box (L1) (Q):	23.42	Jarque-Bera (JB):	7986.46
Prob(Q):	0.00	Prob(JB):	0.00
Heteroskedasticity (H):	0.87	Skew:	0.67
Prob(H) (two-sided):	0.58	Kurtosis:	35.97

Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).