Forecast Pressure Time Series in Tiantan, Beijing

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1 Select attributes

Used Columns :

'Year'

'Month'

'Date'

'Time'

'PRES'

Group by

	No	year	month	day	hour	PM2.5	PM10	SO2	NO2	CO	O3	TEMP	PRES	DEWP	RAIN	wd	WSPM	station
0	1	2013	3	1	0	6.0	6.0	4.0	8.0	300.0	81.0	-0.5	1024.5	-21.4	0.0	NNW	5.7	Tiantan
1	2	2013	3	1	1	6.0	29.0	5.0	9.0	300.0	80.0	-0.7	1025.1	-22.1	0.0	NW	3.9	Tiantan
2	3	2013	3	1	2	6.0	6.0	4.0	12.0	300.0	75.0	-1.2	1025.3	-24.6	0.0	NNW	5.3	Tiantan
3	4	2013	3	1	3	6.0	6.0	4.0	12.0	300.0	74.0	-1.4	1026.2	-25.5	0.0	N	4.9	Tiantan
4	5	2013	3	1	4	5.0	5.0	7.0	15.0	400.0	70.0	-1.9	1027.1	-24.5	0.0	NNW	3.2	Tiantan

			PRES
year	**month**	**day**	
2013	**3**	**1**	1028.783333
		2	1028.850000
		3	1016.458333
		4	1019.454167
		5	1012.704167

2 Aggregate pressure in each date by mean

Visualize data (Trend, Seasonal)

Daily Tiantian pressure from 2013 - 2016.
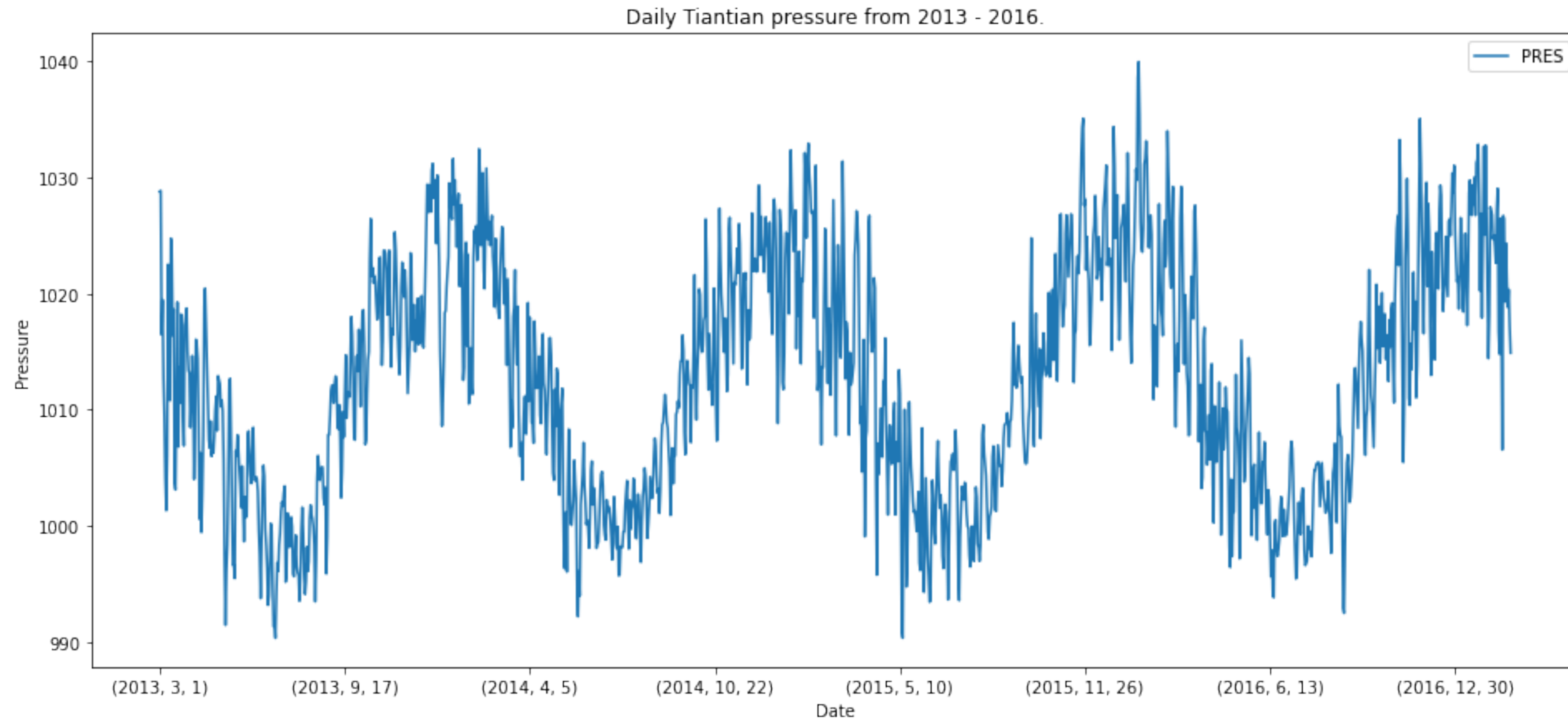
There is same seasonal in every year

Calculate ACF and PACF
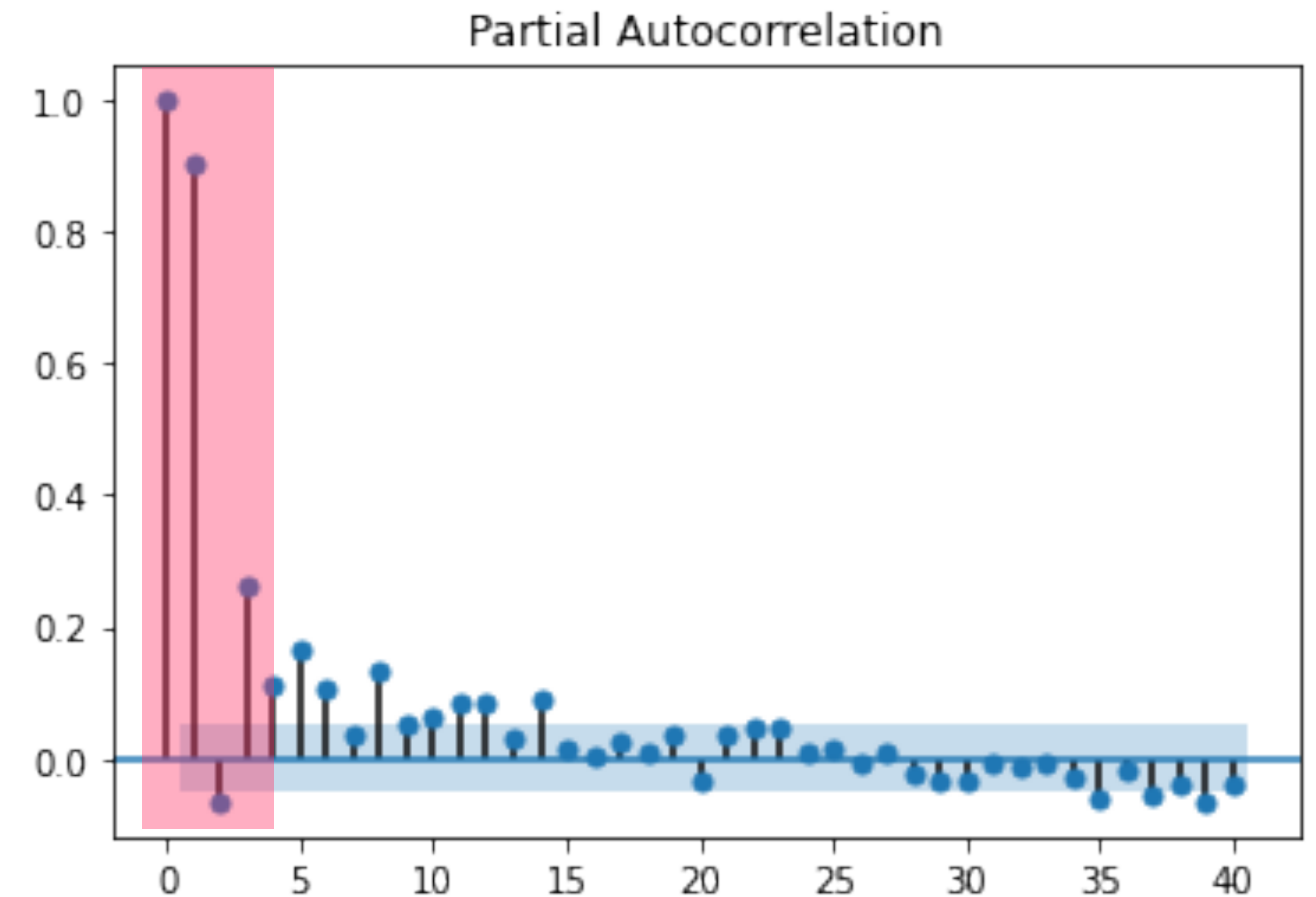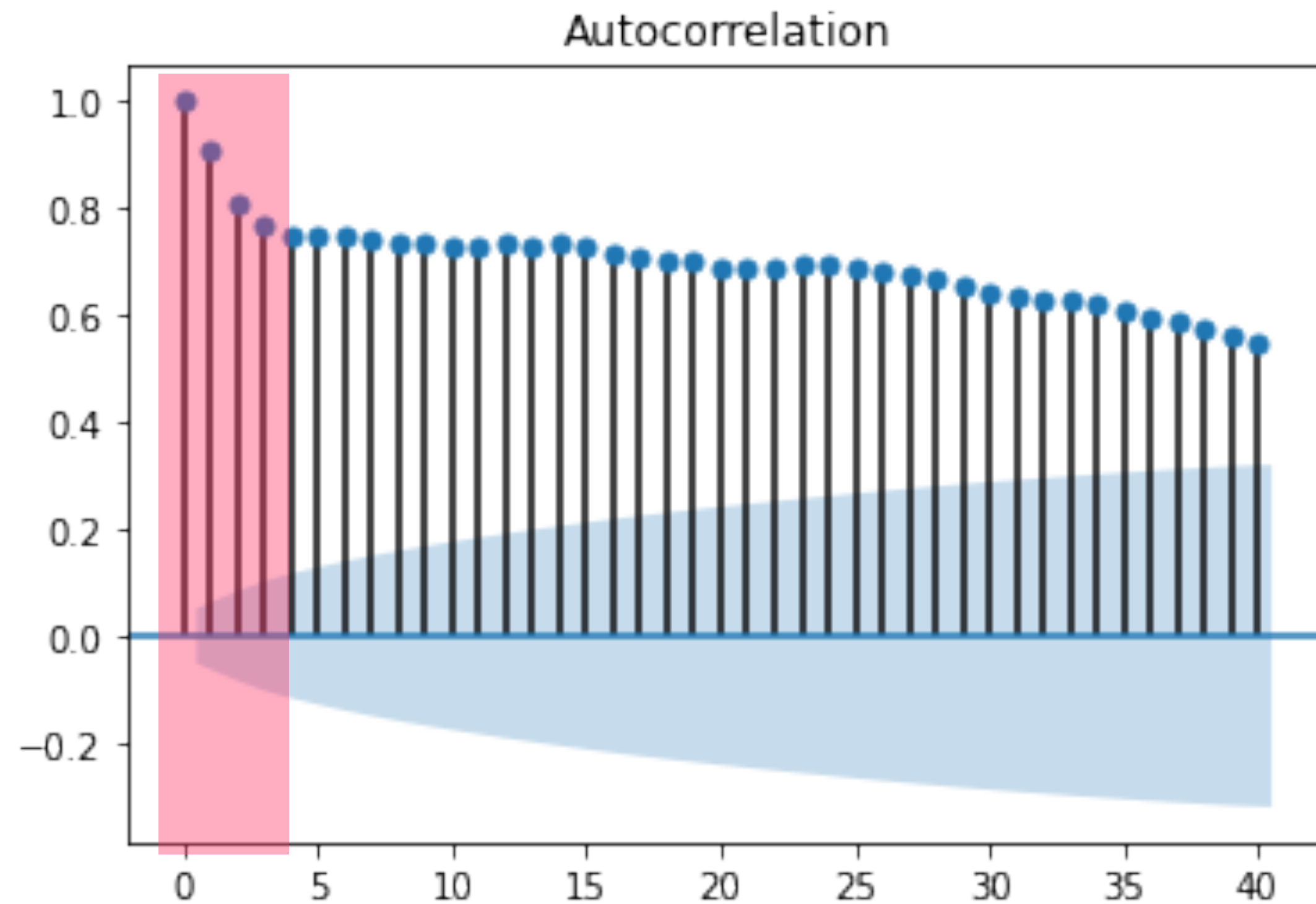
This graph can be interpreted that there is 4 lags of both ACF and PACF before stable

So, we must try ARIMA(4,1,4) first

5A Apply ARIMA model without deseasonal

ARIMA (4,1,1)

```
                         ARIMA Model Results
==============================================================================
Dep. Variable:                  D.PRES   No. Observations:                 1460
Model:                   ARIMA(4, 1, 1)   Log Likelihood               -4074.744
Method:                        css-mle   S.D. of innovations              3.942
Date:                Mon, 09 Mar 2020   AIC                           8163.489
Time:                        23:35:09   BIC                           8200.492
Sample:                             1   HQIC                          8177.293

==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.0018      0.025      0.071      0.944      -0.047       0.050
ar.L1.D.PRES   0.7538      0.032     23.321      0.000       0.690       0.817
ar.L2.D.PRES  -0.3228      0.033     -9.825      0.000      -0.387      -0.258
ar.L3.D.PRES   0.0890      0.033      2.681      0.007       0.024       0.154
ar.L4.D.PRES  -0.0506      0.028     -1.782      0.075      -0.106       0.005
ma.L1.D.PRES  -0.8731      0.020    -44.662      0.000      -0.911      -0.835
                                  Roots
==============================================================================
                  Real          Imaginary           Modulus         Frequency
------------------------------------------------------------------------------
AR.1            1.4251           -1.0261j            1.7561           -0.0993
AR.2            1.4251           +1.0261j            1.7561            0.0993
AR.3           -0.5459           -2.4714j            2.5310           -0.2846
AR.4           -0.5459           +2.4714j            2.5310            0.2846
MA.1            1.1454           +0.0000j            1.1454            0.0000
------------------------------------------------------------------------------
```
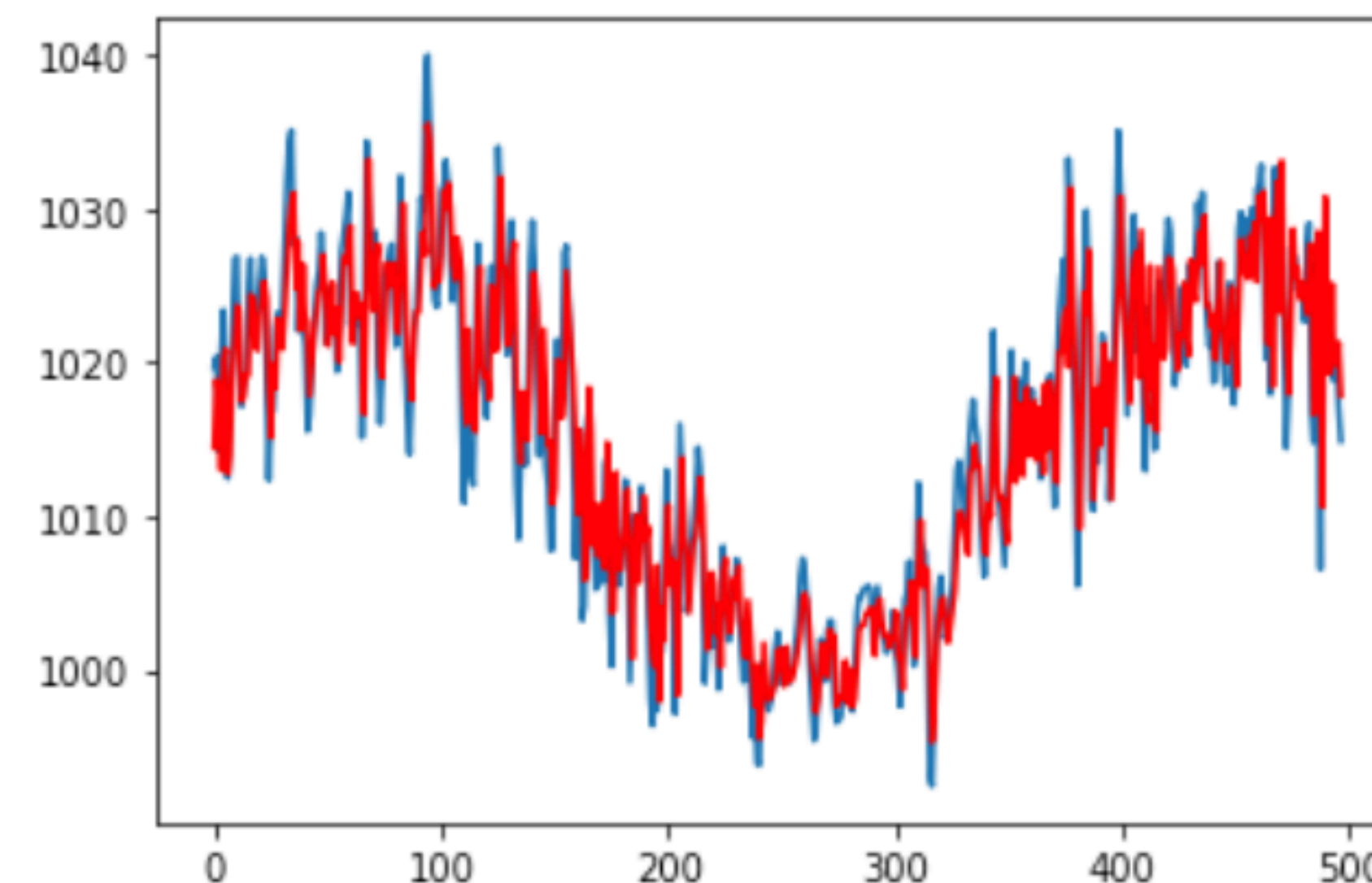
5A Apply ARIMA model without deseasonal

ARIMA (4,1,0)

```
                        ARIMA Model Results
==============================================================================
Dep. Variable:              D.PRES   No. Observations:             1460
Model:              ARIMA(4, 1, 0)   Log Likelihood            -4116.393
Method:                    css-mle   S.D. of innovations           4.057
Date:             Tue, 10 Mar 2020   AIC                        8244.787
Time:                     12:46:30   BIC                        8276.504
Sample:                          1   HQIC                       8256.619

==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
const         -0.0047      0.062     -0.076      0.940      -0.126       0.117
ar.L1.D.PRES  -0.0467      0.026     -1.813      0.070      -0.097       0.004
ar.L2.D.PRES  -0.3439      0.026    -13.429      0.000      -0.394      -0.294
ar.L3.D.PRES  -0.1440      0.026     -5.632      0.000      -0.194      -0.094
ar.L4.D.PRES  -0.1785      0.026     -6.904      0.000      -0.229      -0.128
                               Roots
==============================================================================
                 Real          Imaginary           Modulus         Frequency
------------------------------------------------------------------------------
AR.1           0.6740           -1.2163j            1.3906           -0.1695
AR.2           0.6740           +1.2163j            1.3906            0.1695
AR.3          -1.0772           -1.3176j            1.7019           -0.3591
AR.4          -1.0772           +1.3176j            1.7019            0.3591
------------------------------------------------------------------------------
```
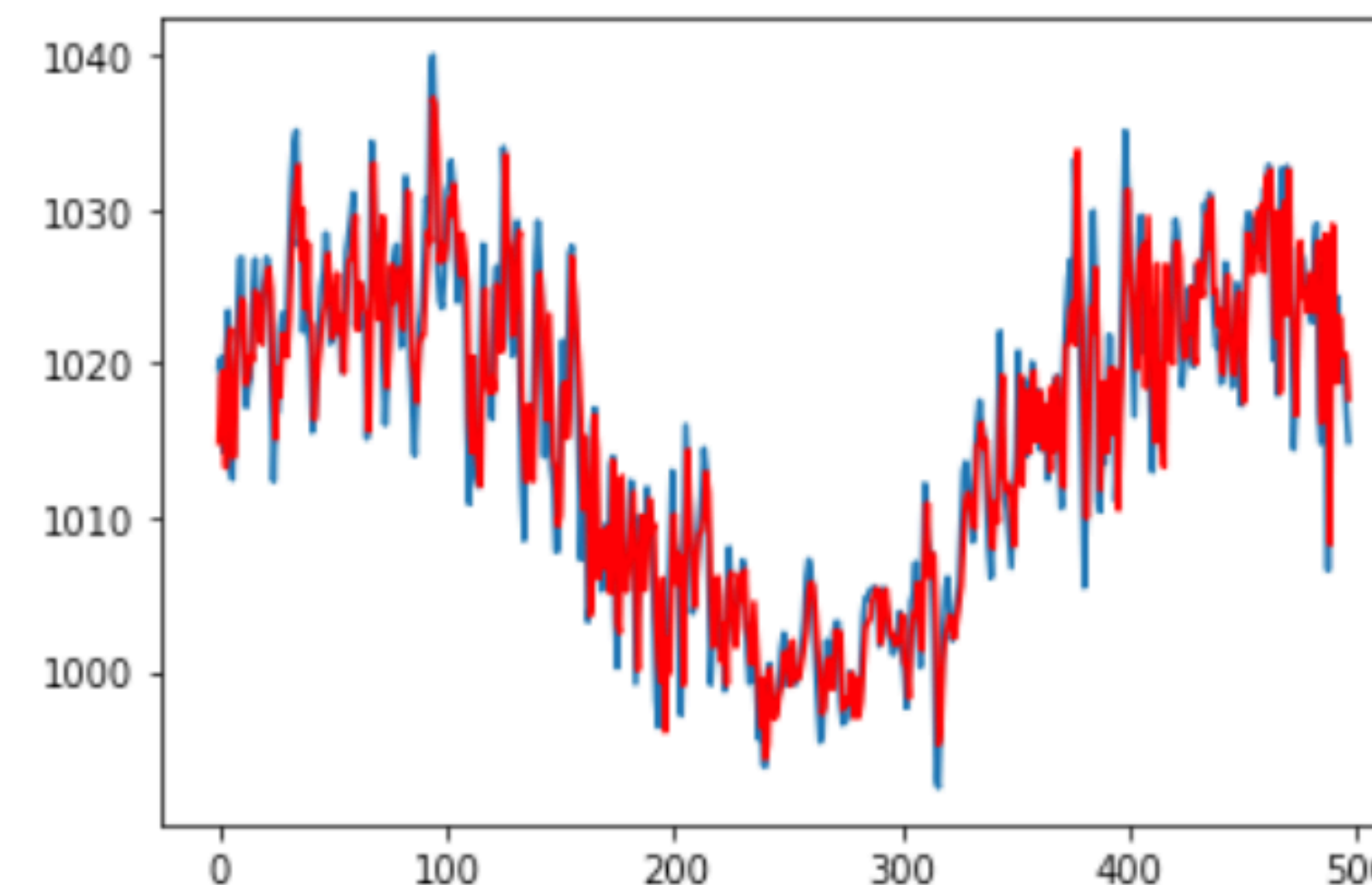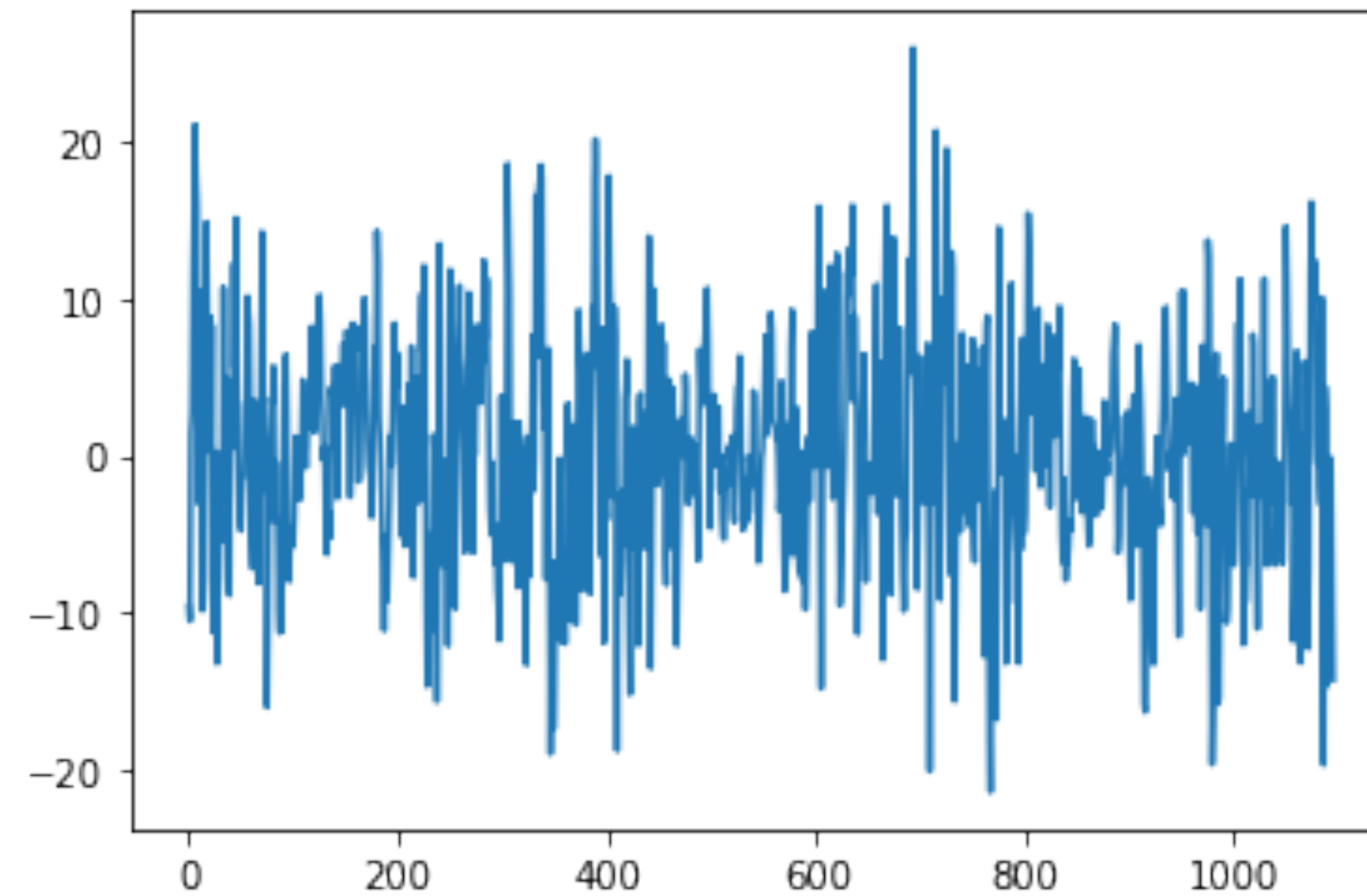
Test MSE: 17.858

5A Apply ARIMA model with deseasonal

$$\text{Diff} = \text{Pres}_{\text{day I}} - \text{Pres}_{\text{day i+365}}$$

			diff
year	month	day	
2014	3	1	−9.612500
		2	−10.550000
		3	1.425000
		4	2.779167
		5	11.612500
...	...	...	...
2017	2	24	−7.308333
		25	−2.900000
		26	−0.158333
		27	−8.875000
		28	−14.308333