In [102…

```
import numpy as np
import pandas as pd
import math
import matplotlib.pyplot as plt
from statsmodels.tsa.ar_model import AutoReg, ar_select_order
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf

data=pd.read_csv("robusta.txt", header=0, sep="\t")
```

In [15]:

```
data
```

Out[15]:

	Month	Price	Change
0	Jul 2002	0.63	-
1	Aug 2002	0.61	-3.17%
2	Sep 2002	0.71	16.39%
3	Oct 2002	0.73	2.82%
4	Nov 2002	0.84	15.07%
…	…	…	…
230	Sep 2021	2.31	10.00%
231	Oct 2021	2.32	0.43%
232	Nov 2021	2.41	3.88%
233	Dec 2021	2.48	2.90%
234	Jan 2022	2.43	-2.02%

235 rows × 3 columns

In [99]:

```
train=data.iloc[:223]
test=data.iloc[223:]
start=len(train)
stop=len(data)-1
AR3fit=AutoReg(data['Price'],lags=3).fit()
predictionsAR3=AR3fit.predict(start=start,end=stop,dynamic=False)
```

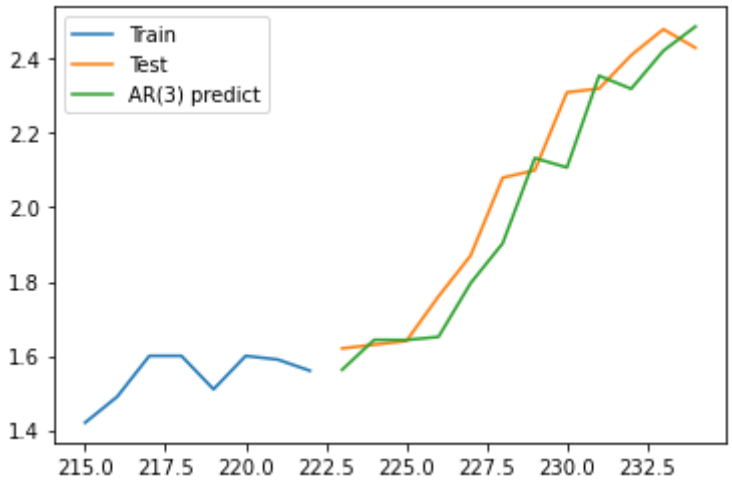
```
C:\anaconda3\lib\site-packages\statsmodels\tsa\ar_model.py:248: FutureWarning: The p
arameter names will change after 0.12 is released. Set old_names to False to use the
new names now. Set old_names to True to use the old names.
  warnings.warn(
```

In [100…

```
train['Price'].iloc[215:].plot(legend=True,label='Train')
test['Price'].plot(legend=True,label='Test')
predictionsAR3.plot(legend=True,label='AR(3) predict')
```

Out[100…

```
<AxesSubplot:>
```



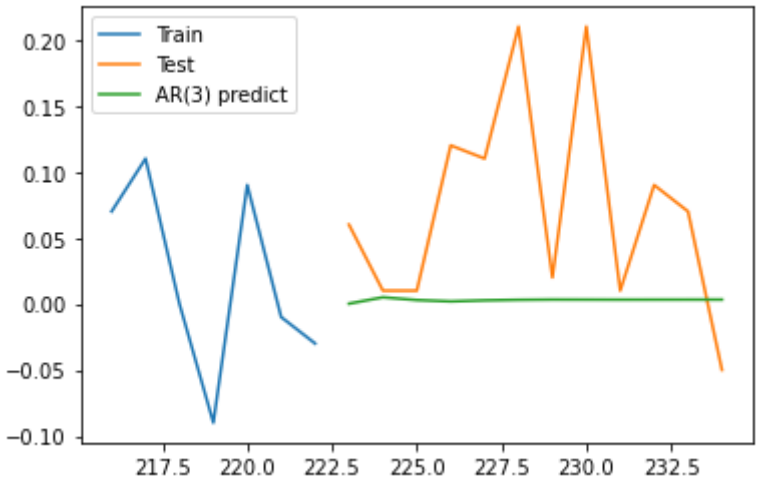
In [105…
```
data['PriceDiff']=data['Price'].diff()
```

In [76]:
```
data.iloc[5:223]['PriceDiff']
```

Out[76]:
```
5      0.00
6      0.07
7     -0.01
8     -0.08
9      0.00
       ...
218    0.00
219   -0.09
220    0.09
221   -0.01
222   -0.03
Name: PriceDiff, Length: 218, dtype: float64
```

In [101…
```
train=data.iloc[1:223]
test=data.iloc[223:]
start=len(train)
stop=len(data)-1
AR3fit=AutoReg(data.iloc[1:223]['PriceDiff'],lags=5).fit()
predictionsAR3diff=AR3fit.predict(start=start,end=stop,dynamic=False)
train['PriceDiff'].iloc[215:].plot(legend=True,label='Train')
test['PriceDiff'].plot(legend=True,label='Test')
predictionsAR3diff.plot(legend=True,label='AR(3) predict')
```

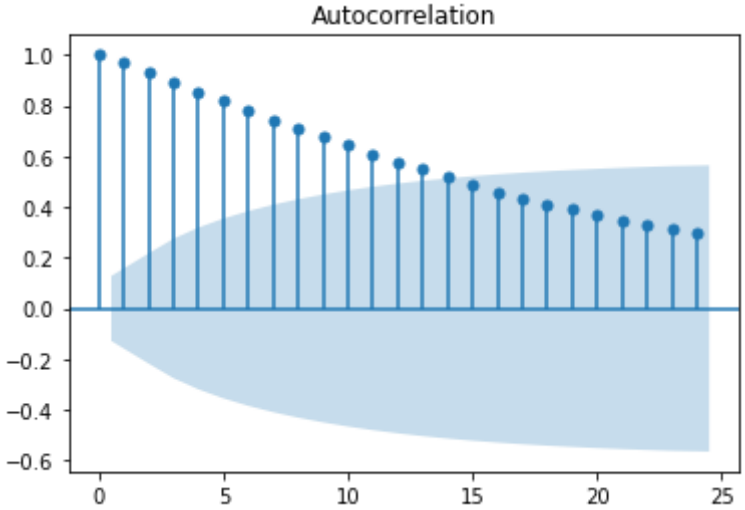
Out[101…
```
C:\anaconda3\lib\site-packages\statsmodels\tsa\ar_model.py:248: FutureWarning: The p
arameter names will change after 0.12 is released. Set old_names to False to use the
new names now. Set old_names to True to use the old names.
  warnings.warn(
<AxesSubplot:>
```

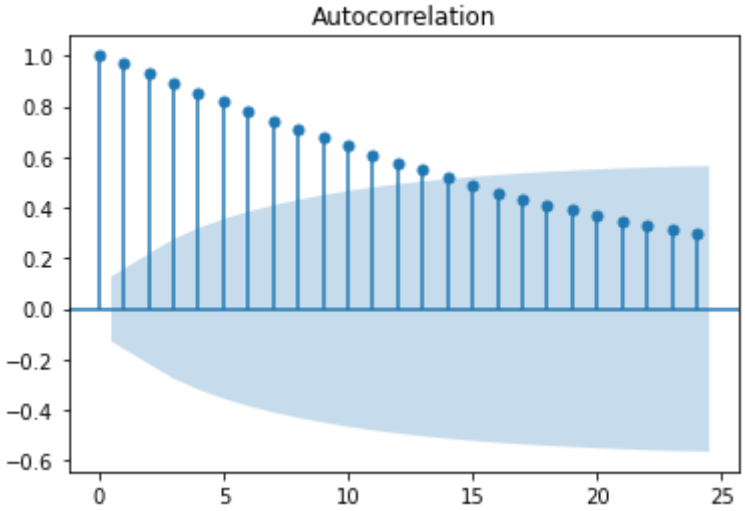


Result of using AutoReg on differenced data is very unsatisfying. Why? Becouse there is no visible correlation in differenced data, as shown below.

In [103…
```
plot_acf(pd.Series(data['Price']))
```

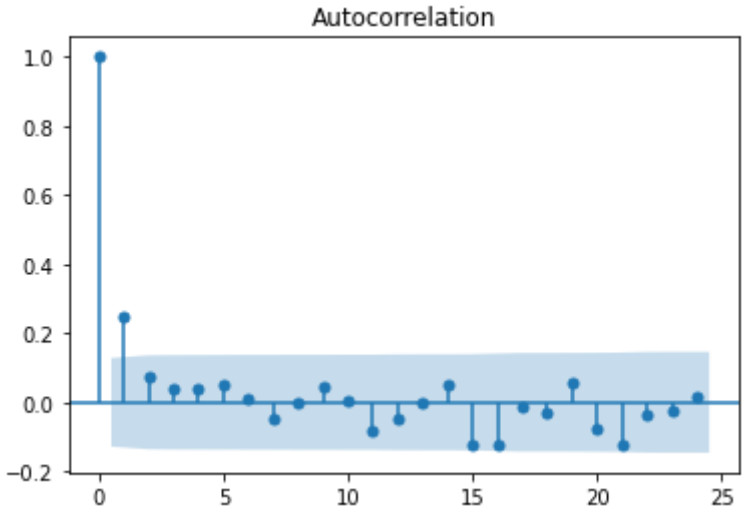
Out[103…

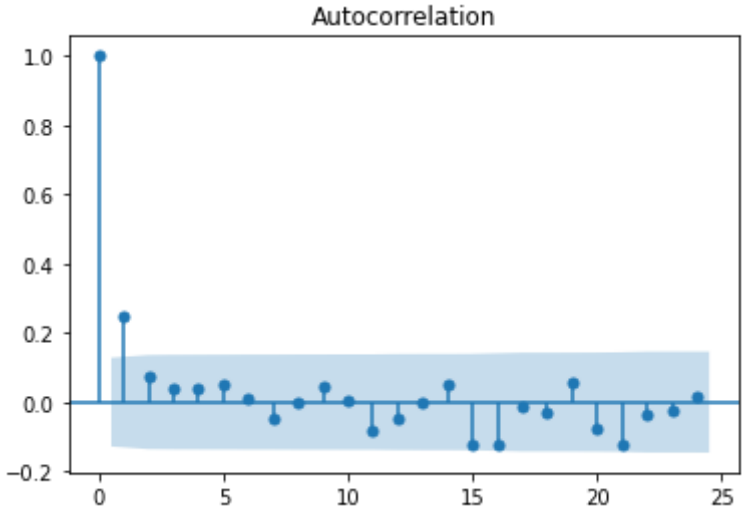




In [108…
```
plot_acf(pd.Series(data['PriceDiff'].iloc[1:]))
```

Out[108…


Autocorrelation
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
5
10
15
20
25


Autocorrelation
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
5
10
15
20
25

In [ ]: