

程序代写代做 CS编程辅导

INF-tut2

June 18, 2021



1 Importing

```
[2]: !pip install sklearn
```

```
Requirement already satisfied: sklearn in c:\users\rluck\anaconda3\lib\site-packages (0.0)
Requirement already satisfied: scikit-learn in c:\users\rluck\anaconda3\lib\site-packages (from sklearn) (0.24.1)
Requirement already satisfied: numpy>=1.13.3 in c:\users\rluck\anaconda3\lib\site-packages (from scikit-learn->sklearn) (1.20.1)
Requirement already satisfied: scipy>=0.19.1 in c:\users\rluck\anaconda3\lib\site-packages (from scikit-learn->sklearn) (1.6.2)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\rluck\anaconda3\lib\site-packages (from scikit-learn->sklearn) (2.1.0)
Requirement already satisfied: joblib>=0.11 in c:\users\rluck\anaconda3\lib\site-packages (from scikit-learn->sklearn) (1.0.1)
```

```
[3]: #importing packages
import pandas as pd
import numpy as np
import statsmodels.api as sm
import statsmodels.formula.api as smf
import matplotlib.pyplot as plt
from sklearn import linear_model
```

2 Reading Excel file saved in hard drive

```
[4]: #reading the file
df = pd.read_excel("C:\\Users\\rluck\\OneDrive\\fisher.xlsx", usecols_
    ↳=["P", "R"])
df.head()
```

```
[4]:      P      R
0  17.0  5.90
1  17.1  5.65
2  17.3  6.42
3  17.5  8.80
```

4 17.6 6.85

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3 Calculating annual inflation from quarterly CPI

```
[5]: #computing the inflation rate
df['Inf'] = 400*(df['R'].shift(1)-df['R'])/df['R'].shift(1).dropna()
df.head()
```



```
[5]:
```

	P	R	
0	17.0	5.90	
1	17.1	5.65	2.346048
2	17.3	6.42	4.651215
3	17.5	8.80	4.597752
4	17.6	6.85	2.279208

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```
[6]: df.tail()
```

```
[6]:
```

	P	R	Inf
103	116.2	7.73	5.197128
104	117.6	7.54	4.790476
105	118.5	7.44	3.049570
106	119.0	7.51	1.684213
107	119.8	7.56	2.680077

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```
[7]: #dropping the N/A values
df1 = df.dropna(subset=['Inf'])
```

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```
[8]: df1.head()
```

```
[8]:
```

	P	R	Inf
1	17.1	5.65	2.346048
2	17.3	6.42	4.651215
3	17.5	8.80	4.597752
4	17.6	6.85	2.279208
5	17.9	6.37	6.760724

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```
[9]: df1.tail()
```

```
[9]:
```

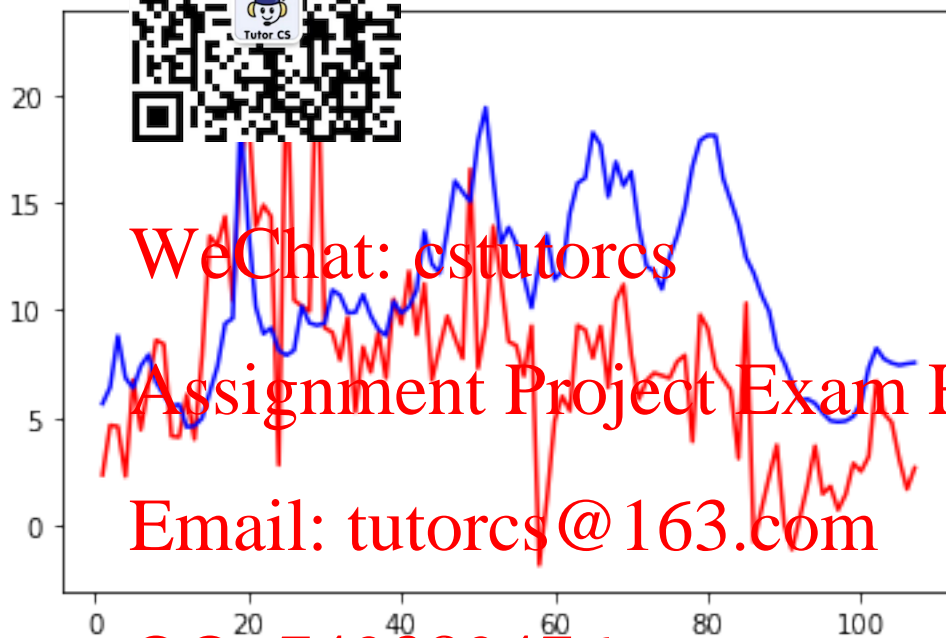
	P	R	Inf
103	116.2	7.73	5.197128
104	117.6	7.54	4.790476
105	118.5	7.44	3.049570
106	119.0	7.51	1.684213
107	119.8	7.56	2.680077

4 Plotting the time series: Inflation

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```
[10]: #plotting the series
plt.plot(df1["Inf"], color='red', label='INF')
plt.plot(df1['R'], color='blue', label='R')
```

```
[10]: [<matplotlib.lines.Line2D at 0x33d3a00>]
```



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5 Linear Regression

```
[11]: reg =linear_model.LinearRegression()
x =df1[['Inf']]
y =df1['R']
reg.fit(x,y)
```

```
[11]: LinearRegression()
```

```
[12]: plt.xlabel('Inflation(Inf%)')
plt.ylabel('Interest Rate(R%)')
plt.scatter(df1.Inf, df1.R, color='green', marker= '+')
plt.plot(df1.Inf, reg.predict(x), color='red')
```

```
[12]: [<matplotlib.lines.Line2D at 0x22fe3b4cb20>]
```



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[13]: *#X & y Variables defined*

```
X = df1[['Inf']]
X = sm.add_constant(X)
y= df1['R']
#OLS model
model = sm.OLS(y,X).fit()
predictions =model.predict(X)
Q = model.summary()
print(Q)
```

OLS Regression Results

```
=====
Dep. Variable:          R      R-squared:          0.110
Model:                  OLS      Adj. R-squared:        0.102
Method:                 Least Squares      F-statistic:         13.01
Date:                   Fri, 18 Jun 2021    Prob (F-statistic):    0.000475
Time:                   22:31:48      Log-Likelihood:       -293.17
No. Observations:      107      AIC:                  590.3
Df Residuals:          105      BIC:                  595.7
Df Model:               1
Covariance Type:       nonrobust
=====
```

	coef	std err	t	P> t	[0.025	0.975]
const	8.6008	0.691	12.445	0.000	7.231	9.971

Inf	0.2898	0.080	3.608	0.000	0.131	0.449
Omnibus:	12.294	Durbin-Watson:	0.288			
Prob(Omnibus):	0.002	Jarque-Bera (JB):	5.767			
Skew:	0.217	Prob(JB):	0.0559			
Kurtosis:	0.8	Cond. No.	16.4			

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Notes:

[1] Standard Error covariance matrix of the errors is correctly specified.

(c) The beta of 0.2898 is statistically significant, given the p-value is less than 5%. The intercept (constant in the above) is 8.690, which indicates the real interest rate.

(d) The ACF and PACF charts show strong auto-correlations for both interest rates and inflation rates, since they are outside the bands. As per PACF, the first-order autocorrelation coefficient is significant, thus explains that R_{t-2} is not directly correlated with R_t but impacts R_t through R_{t-1}

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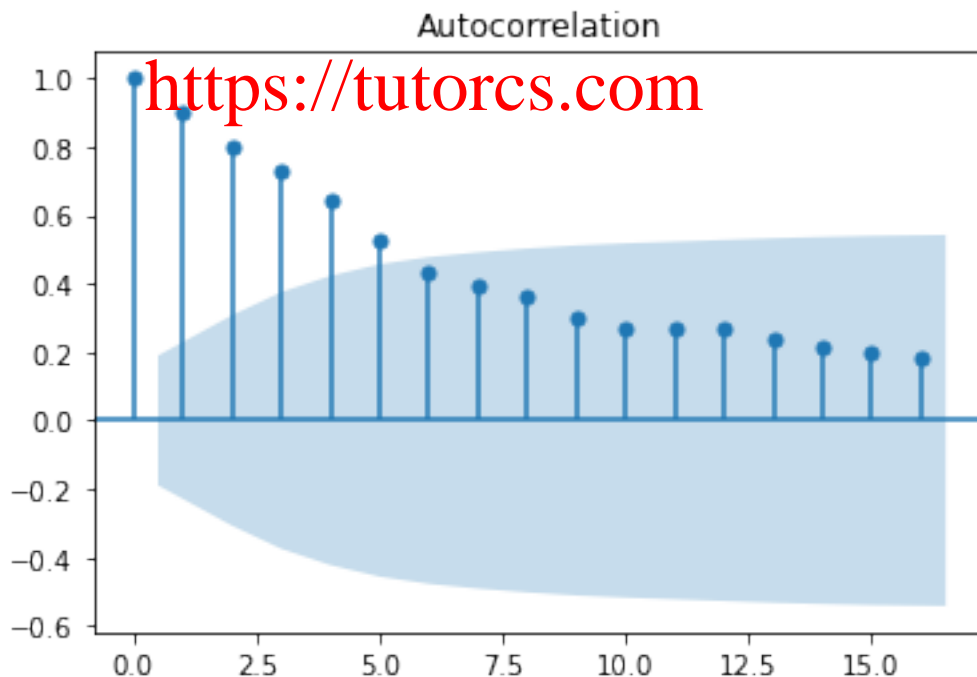
6 Correlogram: ACF and PACF

[14]: #running ACF and PACF for Interest rates

```
dta= df1.R
sm.graphics.tsa.plot_acf(dta.values.squeeze(),lags=16)
sm.graphics.tsa.plot_pacf(dta.values.squeeze(),lags=16)
plt.show()
```

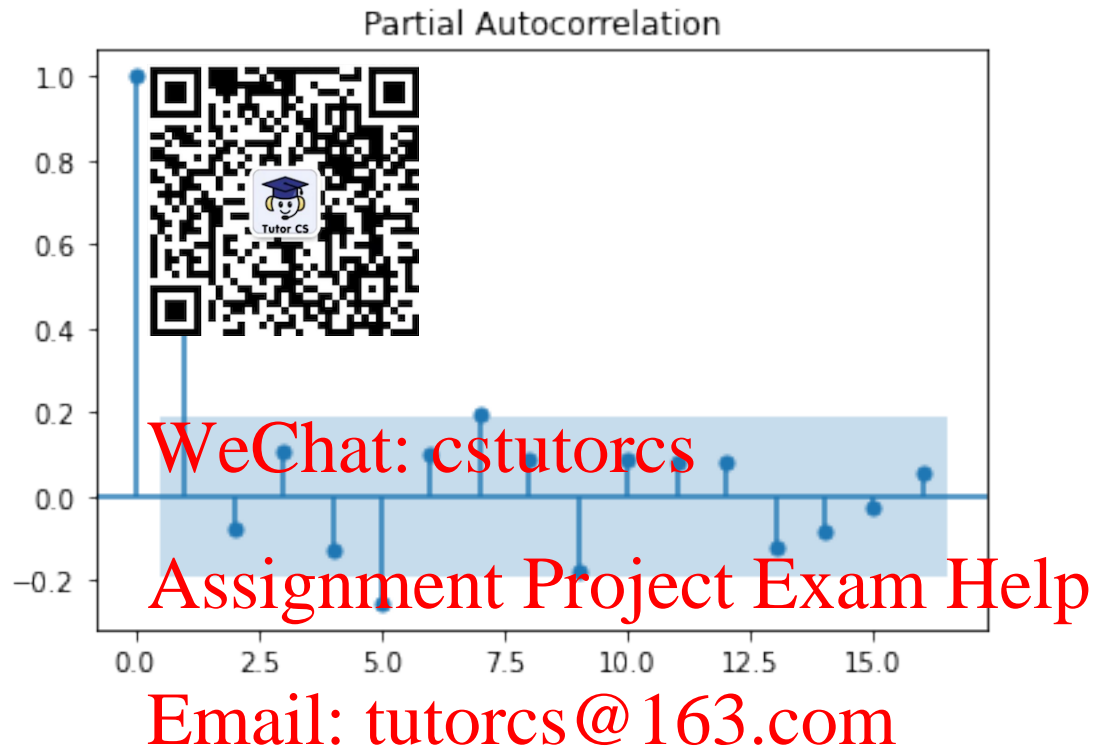
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```
[15]: # Generating the Q tables
dta= df1.R
r,q,p = sm.tsa.acf(dta.values.squeeze(), qstat=True)
data = np.c_[range(1,41), r[1:], q, p]
table = pd.DataFrame(data, columns=['lag', "AC", "Q", "Prob(>Q)"])
print (table.set_index("lag"))
```

	AC	Q	Prob(>Q)
lag			
1.0	0.902000	89.519458	3.036373e-21
2.0	0.800714	160.735161	1.249693e-35
3.0	0.727757	220.130163	1.881836e-47
4.0	0.643173	266.971371	1.434100e-56
5.0	0.522747	298.217241	2.420630e-62
6.0	0.432185	319.786128	4.692303e-66
7.0	0.390572	337.577638	5.612705e-69
8.0	0.359094	352.768802	2.322012e-71
9.0	0.296765	363.249933	9.357349e-73
10.0	0.266010	371.758078	9.546965e-74
11.0	0.269571	380.586555	8.045736e-75
12.0	0.271768	389.653956	5.861576e-76
13.0	0.239723	396.784131	1.068394e-76
14.0	0.213190	402.483940	3.799963e-77

```

15.0 0.201682 407.640445 1.713880e-77
16.0 0.184015 411.930324 1.119543e-77
17.0 0.121160 413.882666 2.312769e-77
18.0 0.069831 414.521694 8.538552e-77
19.0 0.061388 415.001142 2.277027e-76
20.0 0.037563 415.001142 2.277027e-75
21.0 -0.016528 415.001142 2.277027e-75
22.0 -0.049924 415.001142 2.277027e-74
23.0 -0.066728 415.001142 2.277027e-74
24.0 -0.082528 415.001142 2.277027e-73
25.0 -0.116581 415.001142 2.277027e-73
26.0 -0.126028 422.770443 1.130317e-73
27.0 -0.097497 422.770443 1.130317e-72
28.0 -0.077050 423.646894 2.999114e-72
29.0 -0.075916 424.508648 1.881471e-72
30.0 -0.071108 425.274513 2.113107e-71
31.0 -0.052355 425.695155 6.669846e-71
32.0 -0.063438 426.320964 1.867262e-70
33.0 -0.116202 428.449132 2.565716e-70
34.0 -0.165224 432.810623 1.239430e-70
35.0 -0.195566 439.005942 2.546551e-71
36.0 -0.236616 448.202801 1.301903e-72
37.0 -0.287126 461.938759 3.161831e-75
38.0 -0.323681 479.647790 8.151842e-78
39.0 -0.334471 498.835308 4.101115e-81
40.0 -0.351261 520.313409 7.121062e-85

```

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```

C:\Users\rluck\anaconda3\lib\site-packages\statsmodels\tsa\stattools.py:657:
FutureWarning: The default number of lags is changing from 40 to min(int(10 *
np.log10(nobs)), nobs - 1) after 0.12 is released. Set the number of lags to an
integer to silence this warning:
  warnings.warn(
C:\Users\rluck\anaconda3\lib\site-packages\statsmodels\tsa\stattools.py:667:
FutureWarning: fft=True will become the default after the release of the 0.12
release of statsmodels. To suppress this warning, explicitly set fft=False.
  warnings.warn(

```

```

[16]: #running ACF and PACF for Inflation rates
dt= df1.Inf
sm.graphics.tsa.plot_acf(dt.values.squeeze(),lags=16)
sm.graphics.tsa.plot_pacf(dt.values.squeeze(),lags=16)
plt.show()

```

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```
[17]: # Generating the Q tables
dt= df1.Inf
r,q,p = sm.tsa.acf(dt.values.squeeze(), qstat=True)
data = np.c_[range(1,41), r[1:], q, p]
table = pd.DataFrame(data, columns=['lag', "AC", "Q", "Prob(>Q)"])
print (table.set_index('lag'))
```

	AC	Q	Prob(>Q)
1.0	0.538668	3.162278e-08	
2.0	0.546611	6.309573e-15	
3.0	0.520620	9.243909e-20	
4.0	0.512728	125.277975	3.980674e-26
5.0	0.320958	137.056889	7.552935e-28
6.0	0.395231	155.094995	6.469263e-31
7.0	0.263380	163.185481	6.824890e-32
8.0	0.335635	176.456691	5.707403e-34
9.0	0.236423	183.108875	1.136013e-34
10.0	0.276055	192.271705	6.581374e-36
11.0	0.190578	196.884218	3.623768e-36
12.0	0.204584	201.822653	1.371277e-36
13.0	0.144076	204.398177	1.706136e-36
14.0	0.177849	208.364873	1.063236e-36
15.0	0.024400	208.440346	4.073673e-36
16.0	0.057629	208.865988	1.272269e-35
17.0	0.041227	209.086241	4.236566e-35
18.0	-0.013514	209.110173	1.448819e-34
19.0	-0.030582	209.234125	4.918207e-34
20.0	0.145808	212.084192	4.509795e-34
21.0	0.013762	212.109878	1.477257e-33
22.0	0.028119	212.218371	4.546816e-33
23.0	0.070134	212.901328	1.054903e-32
24.0	0.108008	214.540562	1.562105e-32
25.0	-0.003713	214.542523	4.739521e-32
26.0	0.069558	215.239186	1.034074e-31
27.0	0.068827	215.929804	2.224307e-31
28.0	0.084139	216.974961	4.026885e-31
29.0	0.013086	217.000565	1.124209e-30
30.0	0.054102	217.443909	2.569765e-30
31.0	0.039647	217.685134	6.315696e-30
32.0	0.090422	218.956577	9.792370e-30
33.0	0.018652	219.011410	2.534653e-29
34.0	0.045297	219.339228	5.748685e-29
35.0	-0.028321	219.469153	1.399130e-28
36.0	-0.032441	219.642032	3.297061e-28
37.0	-0.074630	220.570003	5.576472e-28
38.0	-0.112505	222.709467	5.615226e-28
39.0	-0.127265	225.487401	4.303657e-28

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```
40.0 -0.077515 226.533343 6.770094e-28
```

```
C:\Users\rluck\anaconda3\lib\site-packages\statsmodels\tsa\stattools.py:657:  
FutureWarning: The default number of lags is changing from 40 to min(int(10 *  
np.log10(nobs)), nobs - 1) after 0.12 is released. Set the number of lags to an  
integer to silence  
warnings.warn(  
C:\Users\rluck\anaconda3\lib\site-packages\statsmodels\tsa\stattools.py:667:  
FutureWarning: fft is the default after the release of the 0.12  
release of statsmodels. To silence this warning, explicitly set fft=False.  
warnings.warn(  
[ ]:
```



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