```
C:\Python37\python.exe "D:\Program Files\PyCharm 2019.2
.1\helpers\pydev\pydevconsole.py" --mode=client --port=
14049

import sys; print('Python %s on %s' % (sys.version, sys
.platform))
sys.path.extend(['E:\\C-01-pythonl□□', 'E:/C-01-
pythonl□□'])

Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53
) [MSC v.1916 32 bit (Intel)]
Type 'copyright', 'credits' or 'license' for more
information
IPython 7.11.1 -- An enhanced Interactive Python. Type
 '?' for help.
PyDev console: using IPython 7.11.1
```

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53
) [MSC v.1916 32 bit (Intel)] on win32
In[2]: runfile('E:/C-05-□□□□□□/Data_analyse_train/
SHstock_predict/SHstock_predict.py', wdir='E:/C-05-
□□□□□□/Data_analyse_train/SHstock_predict')
            Timestamp   Price
Timestamp
1990-12-19 1990-12-19   96.05
1990-12-20 1990-12-20  104.30
1990-12-21 1990-12-21  109.07
1990-12-24 1990-12-24  113.57
1990-12-25 1990-12-25  120.09
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
```

```
 This problem is unconstrained.
 N =            1     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  8.38918D+00    |proj g|=  0.
00000D+00

           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
```

```
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    1      0      1      0     0     0   0.000D+00   8.
389D+00
  F =   8.3891800015170919

CONVERGENCE: NORM_OF_PROJECTED_GRADIENT_<=_PGTOL

RUNNING THE L-BFGS-B CODE
 This problem is unconstrained.

            * * *
```

```
Machine precision = 2.220D-16
 N =            2     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  7.78968D+00    |proj g|=  1.
24658D-02

At iterate    5    f=  7.78855D+00    |proj g|=  7.
56728D-05

At iterate   10    f=  7.78854D+00    |proj g|=  1.
30713D-03

At iterate   15    f=  7.78834D+00    |proj g|=  2.
86260D-04
```

```
           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

           * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
```

```
    2     18     20      1     0     0   0.000D+00   7.
788D+00
  F =   7.7883382661592560

CONVERGENCE: NORM_OF_PROJECTED_GRADIENT_<=_PGTOL

□□□□: (0, 2)
□□□□: (0, 3)
 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            2     M =           12

At X0         0 variables are exactly at the bounds
```

```
At iterate    0    f=  6.59375D+00    |proj g|=  6.
64651D-03

At iterate    5    f=  6.59219D+00    |proj g|=  4.
79616D-06

At iterate   10    f=  6.59219D+00    |proj g|=  3.
19744D-05

At iterate   15    f=  6.59216D+00    |proj g|=  4.
70290D-04

At iterate   20    f=  6.59111D+00    |proj g|=  7.
15250D-04
```

* * *

```
Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

           * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    2     24     35      1     0     0   8.882D-07   6.
591D+00
```

```
   F =   6.5910573383422966

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            3     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.54128D+00    |proj g|=  5.
23324D-03
```

```
At iterate    5    f=  6.54044D+00    |proj g|=  2.
52243D-05

At iterate   10    f=  6.54044D+00    |proj g|=  2.
04281D-05

At iterate   15    f=  6.54042D+00    |proj g|=  1.
92220D-03

At iterate   20    f=  6.53967D+00    |proj g|=  2.
68292D-03

At iterate   25    f=  6.53953D+00    |proj g|=  3.
73035D-06

           * * *
```

```
 Tit   = total number of iterations
 Tnf   = total number of function evaluations
 Tnint = total number of segments explored during Cauchy
  searches
 Skip  = number of BFGS updates skipped
 Nact  = number of active bounds at final generalized
 Cauchy point
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    3     28     35      1     0     0   5.329D-07   6.
 540D+00
  F =   6.5395272639161171
```

```
CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

RUNNING THE L-BFGS-B CODE
 This problem is unconstrained.

           * * *

Machine precision = 2.220D-16
 N =            4     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.52500D+00    |proj g|=  4.
21103D-03

At iterate    5    f=  6.52455D+00    |proj g|=  4.
```

```
28191D-04

At iterate   10    f=  6.52455D+00    |proj g|=  8.
61533D-06

At iterate   15    f=  6.52454D+00    |proj g|=  1.
79501D-04

At iterate   20    f=  6.52448D+00    |proj g|=  4.
35563D-03

At iterate   25    f=  6.52387D+00    |proj g|=  1.
72928D-04

At iterate   30    f=  6.52387D+00    |proj g|=  1.
33227D-06
```

```
                 * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

              * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    4     32     40      1     0     0   0.000D+00   6.
```

```
524D+00
  F =   6.523870653172190

CONVERGENCE: NORM_OF_PROJECTED_GRADIENT_<=_PGTOL

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            5     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.51556D+00    |proj g|=  6.
36486D-03
```

```
At iterate    5    f=  6.51488D+00    |proj g|=  6.
83897D-05

At iterate   10    f=  6.51488D+00    |proj g|=  1.
97176D-05

At iterate   15    f=  6.51488D+00    |proj g|=  2.
69029D-04

At iterate   20    f=  6.51484D+00    |proj g|=  1.
37188D-03

At iterate   25    f=  6.51405D+00    |proj g|=  3.
87157D-04

At iterate   30    f=  6.51405D+00    |proj g|=  5.
```

32907D-07

* * *

Tit = total number of iterations
Tnf = total number of function evaluations
Tnint = total number of segments explored during Cauchy searches
Skip = number of BFGS updates skipped
Nact = number of active bounds at final generalized Cauchy point
Projg = norm of the final projected gradient
F = final function value

* * *

N	Tit	Tnf	Tnint	Skip	Nact	Projg

```
         F
    5      31      42       1      0      0   6.217D-07   6.
514D+00
  F =   6.5140478372685990

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            3     M =           12

At X0         0 variables are exactly at the bounds
```

```
 At iterate    0    f=  6.53059D+00    |proj g|=  4.
65050D-03

 At iterate    5    f=  6.53003D+00    |proj g|=  3.
90799D-06

 At iterate   10    f=  6.53003D+00    |proj g|=  1.
36158D-04

 At iterate   15    f=  6.52935D+00    |proj g|=  7.
84528D-04

 At iterate   20    f=  6.52933D+00    |proj g|=  1.
07914D-04

               * * *
```

```
 Tit   = total number of iterations
 Tnf   = total number of function evaluations
 Tnint = total number of segments explored during Cauchy
  searches
 Skip  = number of BFGS updates skipped
 Nact  = number of active bounds at final generalized
 Cauchy point
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    3     22     29      1     0     0   0.000D+00   6.
 529D+00
  F =   6.5293303666835003
```

```
CONVERGENCE: NORM_OF_PROJECTED_GRADIENT_<=_PGTOL

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            4     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.53044D+00    |proj g|=  4.
68194D-03

At iterate    5    f=  6.52989D+00    |proj g|=  2.
```

```
43272D-04

 At iterate   10    f=  6.52989D+00    |proj g|=  2.
74447D-05

 At iterate   15    f=  6.52988D+00    |proj g|=  6.
15774D-04

 At iterate   20    f=  6.52923D+00    |proj g|=  1.
11537D-03

 At iterate   25    f=  6.52917D+00    |proj g|=  1.
84741D-05

 At iterate   30    f=  6.52917D+00    |proj g|=  1.
77636D-07
```

```
                 * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

              * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    4     31     39      1     0     0   8.882D-08   6.
```

```
529D+00
  F =   6.529173630680504

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            5     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.51474D+00    |proj g|=  3.
99529D-03
```

```
At iterate    5    f=  6.51435D+00    |proj g|=  1.
07114D-03

At iterate   10    f=  6.51428D+00    |proj g|=  2.
11386D-05

At iterate   15    f=  6.51428D+00    |proj g|=  4.
05009D-05

At iterate   20    f=  6.51428D+00    |proj g|=  6.
96065D-04

At iterate   25    f=  6.51374D+00    |proj g|=  1.
85629D-03

At iterate   30    f=  6.51360D+00    |proj g|=  4.
```

```
07407D-04

At iterate   35    f=  6.51360D+00    |proj g|=  7.
99361D-07

At iterate   40    f=  6.51360D+00    |proj g|=  3.
55271D-07

           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
```

```
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    5     40     49      1     0     0   3.553D-07   6.
514D+00
  F =   6.5135974997484247

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

            * * *
```

```
Machine precision = 2.220D-16
 N =            6     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.51318D+00    |proj g|=  5.
69500D-03

At iterate    5    f=  6.51261D+00    |proj g|=  7.
68008D-04

At iterate   10    f=  6.51257D+00    |proj g|=  6.
77680D-05

At iterate   15    f=  6.51257D+00    |proj g|=  2.
25597D-05
```

```
At iterate   20    f=  6.51256D+00    |proj g|=  1.
78817D-03

At iterate   25    f=  6.51188D+00    |proj g|=  5.
38911D-03

At iterate   30    f=  6.51181D+00    |proj g|=  1.
34115D-05

           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
```

```
 Nact  = number of active bounds at final generalized
 Cauchy point
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    6     32     41      1     0     0   3.553D-07   6.
512D+00
  F =   6.5118149314743823

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE
```

```
           * * *

Machine precision = 2.220D-16
 N =            4     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.53046D+00    |proj g|=  4.
94156D-03

At iterate    5    f=  6.52987D+00    |proj g|=  4.
08562D-06

At iterate   10    f=  6.52987D+00    |proj g|=  4.
20997D-05
```

```
At iterate   15    f=  6.52976D+00    |proj g|=  3.
03020D-03

At iterate   20    f=  6.52916D+00    |proj g|=  8.
71481D-04

At iterate   25    f=  6.52915D+00    |proj g|=  2.
44249D-05

           * * *


 Warning:  more than 10 function and gradient
   evaluations in the last line search.  Termination
   may possibly be caused by a bad search direction.
Tit   = total number of iterations
Tnf   = total number of function evaluations
```

```
 Tnint = total number of segments explored during Cauchy
  searches
 Skip  = number of BFGS updates skipped
 Nact  = number of active bounds at final generalized
 Cauchy point
 Projg = norm of the final projected gradient
 F     = final function value

            * * *

    N    Tit     Tnf  Tnint  Skip  Nact     Projg
         F
     4     27     55      1     0     0   1.972D-05   6.
 529D+00
   F =   6.529154547817739 7

 CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH
```

```
 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            5     M =           12

At X0         0 variables are exactly at the bounds

At iterate    0    f=  6.52724D+00    |proj g|=  4.
35634D-03

At iterate    5    f=  6.52676D+00    |proj g|=  1.
93978D-04
```

□□ - unknown

```
At iterate   10    f=  6.52676D+00    |proj g|=  3.
99680D-06

At iterate   15    f=  6.52676D+00    |proj g|=  1.
62448D-04

At iterate   20    f=  6.52664D+00    |proj g|=  3.
79439D-03

At iterate   25    f=  6.52608D+00    |proj g|=  7.
22977D-04

At iterate   30    f=  6.52608D+00    |proj g|=  4.
93827D-05

At iterate   35    f=  6.52608D+00    |proj g|=  1.
41220D-05
```

```
At iterate   40    f=  6.52608D+00    |proj g|=  1.
77636D-07

           * * *


Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

           * * *
```

```
   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    5     40     51      1     0     0   1.776D-07   6.
526D+00
  F =   6.5260769648342327

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

 This problem is unconstrained.
RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            6     M =           12
```

```
 At X0         0 variables are exactly at the bounds

 At iterate    0    f=  6.51112D+00    |proj g|=  4.
48628D-03

 At iterate    5    f=  6.51063D+00    |proj g|=  2.
33085D-03

 At iterate   10    f=  6.51049D+00    |proj g|=  3.
59002D-04

 At iterate   15    f=  6.51049D+00    |proj g|=  3.
73035D-06

 At iterate   20    f=  6.51049D+00    |proj g|=  4.
20997D-05
```

```
 At iterate   25    f=  6.51048D+00    |proj g|=  6.
91536D-04

 At iterate   30    f=  6.50972D+00    |proj g|=  1.
09033D-03

 At iterate   35    f=  6.50968D+00    |proj g|=  5.
00044D-05

 At iterate   40    f=  6.50968D+00    |proj g|=  1.
66089D-05

           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy
```

```
 searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized
Cauchy point
Projg = norm of the final projected gradient
F     = final function value

           * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg
        F
    6     42     61      1     0     0   1.315D-05   6.
510D+00
  F =   6.5096765098397205

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH
```

```
 RUNNING THE L-BFGS-B CODE

           * * *

Machine precision = 2.220D-16
 N =            7     M =           12

At X0         0 variables are exactly at the bounds
 This problem is unconstrained.

At iterate    0    f=  6.51391D+00    |proj g|=  7.
24318D-03

At iterate    5    f=  6.51321D+00    |proj g|=  4.
02167D-04

At iterate   10    f=  6.51320D+00    |proj g|=  5.
```

```
79981D-05

At iterate   15    f=  6.51320D+00    |proj g|=  6.
62581D-05

At iterate   20    f=  6.51320D+00    |proj g|=  1.
47438D-05

At iterate   25    f=  6.51320D+00    |proj g|=  2.
14584D-04

At iterate   30    f=  6.51265D+00    |proj g|=  2.
55778D-03

At iterate   35    f=  6.51251D+00    |proj g|=  2.
51621D-04
```

```
 At iterate   40    f=  6.51251D+00    |proj g|=  9.
 50351D-06

           * * *

 Tit   = total number of iterations
 Tnf   = total number of function evaluations
 Tnint = total number of segments explored during Cauchy
  searches
 Skip  = number of BFGS updates skipped
 Nact  = number of active bounds at final generalized
 Cauchy point
 Projg = norm of the final projected gradient
 F     = final function value

           * * *
```

```
    N    Tit      Tnf  Tnint  Skip  Nact     Projg
         F
    7     42      53      1     0     0   5.329D-07   6.
513D+00
  F =   6.5125095124134624

CONVERGENCE: REL_REDUCTION_OF_F_<=_FACTR*EPSMCH

□□□□:                                ARMA Model Results

==============================================================
=========================
Dep. Variable:                   Price   No.
Observations:                      339
Model:                    ARMA(3, 2)   Log Likelihood
               -2206.780
Method:                       css-mle   S.D. of
```

```
innovations                   161.512
Date:                  Sun, 23 Feb 2020   AIC
                              4427.561
Time:                           13:32:36   BIC
                              4454.343
Sample:                       12-31-1990   HQIC
                             4438.233
                            - 02-28-2019

==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
const        1831.3647    527.277      3.473      0.001     797.921    2864.808
```

```
ar.L1.Price     0.5214      0.175       2.986       0.003
       0.179       0.864
ar.L2.Price     0.2194      0.238       0.921       0.357
      -0.247       0.686
ar.L3.Price     0.2243      0.130       1.719       0.086
      -0.031       0.480
ma.L1.Price     0.8261      0.161       5.124       0.000
       0.510       1.142
ma.L2.Price     0.5442      0.095       5.736       0.000
       0.358       0.730
                                    Roots

=============================================================
=======================
                  Real          Imaginary
Modulus         Frequency
-------------------------------------------------------------
```

```
------------------------
AR.1                 1.0211             -0.0000j                 1.
0211                -0.0000
AR.2                -0.9998             -1.8350j                 2.
0897                -0.3294
AR.3                -0.9998             +1.8350j                 2.
0897                 0.3294
MA.1                -0.7590             -1.1231j                 1.
3555                -0.3446
MA.2                -0.7590             +1.1231j                 1.
3555                 0.3446
-------------------------------------------------------------------
------------------------
2019-02-28    2508.819393
2019-03-31    2842.743776
2019-04-30    2861.324475
2019-05-31    2798.466278
```

```
2019-06-30    2788.400966
2019-07-31    2773.526829
2019-08-31    2749.466732
2019-09-30    2731.401413
2019-10-31    2713.367440
2019-11-30    2694.605241
2019-12-31    2676.814628
2020-01-31    2659.377800
2020-02-29    2642.175315
Name: forecast, dtype: float64
```