Assignment #3 - Simeng Li

Goals:

- Prepare the code for calculating the beginning of 2022 risk exposures of stocks in preparation for your BA870 Individual Project.
- Learn how to download monthly stock returns from WRDS for a large set of companies.
- Estimate the Fama-French Risk Factor exposures for a large number of stocks (Hint: using a loop in Python).
- Save the estimated Risk Factor exposures for the 100 stocks to a CSV file (for future use in your BA870 Project).
- Provide a report of your completed assignment and analysis using “Markdown” text boxes in Colab Notebook
- Share a Colab Notebook using shareable weblink.
- Print a completed and executed Colab Notebook and submit in PDF format.

Requirments:
Create a new Colab Notwbook with the name "Assignment #3 - YOUR NAME.ipynb". Your notebook should have comments and explanatory textbooks to do the following:
(i) Install necessary packages and libraries.
(ii) Read in the CSV file with monthly stock returns for 60 months (2017-2021) for the 100 stocks. This is the file you created in Step (3) [100-Stocks-Returns.csv"].
(iii) Create a LOOP that will perform the following tasks for each of the 100 stocks:

- (a) Merge the stocks returns (60 months) for each stock with the FF Risk Factor data ("FF-Factors-2017-2021.csv").
- (b) Run an OLS regression for each stock (60 months) using FF 3-Factor model.
- (c) Extract the following output items from the regression results:
  - TICKER symbol
  - R-squared of the regression
  - Adj. R-squared of the regression
  - Regression "alpha" (ie, const)
  - Coefficient on the variable mktrf
  - Coefficient on the variable smb
  - Coefficient on the variable hml

  For additional help on extracting the regression items, please read the documentation:

  https://www.statsmodels.org/dev/examples/notebooks/generated/ols.html (https://www.statsmodels.org/dev/examples/notebooks/generated/ols.html)
- (d) Store the above items (TICKER, R-squared, Adj. R-squared, const, mktrf, smb, hml) to a row in a dataframe.
- (e) Repeat (a)-(d) for all 100 stocks.

Import libraries and packages

In [3]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import statsmodels.api as sm
```

Upload Stocks Returns data

In [4]:

```
data = pd.read_csv('/content/100-Stocks-Returns.csv')
data.head(3)
```

Out[4]:

	PERMNO	date	TICKER	RET
0	10220	20170131	BWXT	0.045088
1	10220	20170228	BWXT	0.119306
2	10220	20170331	BWXT	0.026916

In [5]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6000 entries, 0 to 5999
Data columns (total 4 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   PERMNO  6000 non-null   int64  
 1   date    6000 non-null   int64  
 2   TICKER  6000 non-null   object 
 3   RET     6000 non-null   float64
dtypes: float64(1), int64(2), object(1)
memory usage: 187.6+ KB
```

Upload Fama-French monthly risk factor data

In [6]:

```
ff_factors = pd.read_csv('/content/FF-Factors-2017-2021.csv')
ff_factors.head(3)
```

Out[6]:

	dateff	mktrf	smb	hml	rf
0	20170131	0.0194	-0.0113	-0.0274	0.0004
1	20170228	0.0357	-0.0204	-0.0167	0.0004
2	20170331	0.0017	0.0113	-0.0333	0.0003

List varaibles in FF dataframe

In [7]:

```
ff_factors.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 60 entries, 0 to 59
Data columns (total 5 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   dateff  60 non-null     int64  
 1   mktrf   60 non-null     float64
 2   smb     60 non-null     float64
 3   hml     60 non-null     float64
 4   rf      60 non-null     float64
dtypes: float64(4), int64(1)
memory usage: 2.5 KB
```

Rename date column to "date" to match WRDS data "date" column for Stocks Returns data

In [8]:

```
ff_factors.rename(columns={'dateff':'date'}, inplace=True)
ff_factors.head()
```

Out[8]:

	date	mktrf	smb	hml	rf
0	20170131	0.0194	-0.0113	-0.0274	0.0004
1	20170228	0.0357	-0.0204	-0.0167	0.0004
2	20170331	0.0017	0.0113	-0.0333	0.0003
3	20170428	0.0109	0.0072	-0.0213	0.0005
4	20170531	0.0106	-0.0252	-0.0375	0.0006

Create a LOOP that will perform the following tasks for each of the 100 stocks:

- (a) Merge the stocks returns (60 months) for each stock with the FF Risk Factor data ("FF-Factors-2017-2021.csv").
- (b) Run an OLS regression for each stock (60 months) using FF 3-Factor model.
- (c) Extract the following output items from the regression results:
  - TICKER symbol
  - R-squared of the regression
  - Adj. R-squared of the regression
  - Regression "alpha" (ie, const)
  - Coefficient on the variable mktrf
  - Coefficient on the variable smb
  - Coefficient on the variable hml

In [9]:

```
# Create blank list for the final output
ticker = []
r_squared = []
adj_r_squared = []
alpha = []
bata_mktrf = []
bata_smb = []
bata_hml = []

# Loop for extracting the output variables
for i in data.TICKER.unique().tolist():
  # Extract sub ticker data
  sub_df = data.loc[data['TICKER'] == i]
  # Merge the sub ticker data with Fama-French monthly risk factor data
  merge_df = pd.merge(sub_df, ff_factors, on='date', how='outer')
  # Show one line of the merged data
  print(merge_df.head(1))
  # Define the inputs of the regression
  y = merge_df["RET"] - merge_df["rf"]
  X = merge_df[["mktrf","smb","hml"]]
  # Use statsmodels
  X = sm.add_constant(X) # adding a constant
  model = sm.OLS(y, X).fit()

  # Extract the output of the model
  ticker.append(i)
  r_squared.append(model.rsquared)
  adj_r_squared.append(model.rsquared_adj)
  alpha.append(model.params[0])
  bata_mktrf.append(model.params[1])
  bata_smb.append(model.params[2])
  bata_hml.append(model.params[3])

  #Print out regression statistics
  print(model.summary())
```

```
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   10220  20170131   BWXT  0.045088  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                          y   R-squared:
0.320
Model:                                OLS   Adj. R-squared:
0.283
Method:                     Least Squares   F-statistic:
8.765
Date:                   Wed, 13 Apr 2022   Prob (F-statistic):
7.38e-05
Time:                           02:52:01   Log-Likelihood:
76.894
No. Observations:                      60   AIC:
-145.8
Df Residuals:                          56   BIC:
-137.4
Df Model:                               3
Covariance Type:               nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0085      0.010     -0.869      0.388      -0.028
0.011
mktrf          1.0351      0.206      5.020      0.000       0.622
1.448
smb           -0.2555      0.359     -0.711      0.480      -0.975
0.464
hml           -0.0253      0.257     -0.099      0.922      -0.540
0.489
==============================================================================
==========
Omnibus:                        6.773   Durbin-Watson:
1.853
Prob(Omnibus):                  0.034   Jarque-Bera (JB):
7.162
Skew:                          -0.476   Prob(JB):
0.0279
Kurtosis:                       4.399   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   10318  20170131   BCPC  0.015729  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                          y   R-squared:
0.151
Model:                                OLS   Adj. R-squared:
0.106
Method:                     Least Squares   F-statistic:
```

```
3.321
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0262
Time:                        02:52:01   Log-Likelihood:
82.236
No. Observations:                  60   AIC:
-156.5
Df Residuals:                      56   BIC:
-148.1
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const          0.0076      0.009      0.857      0.395      -0.010
0.025
mktrf          0.4775      0.189      2.532      0.014       0.100
0.855
smb            0.2320      0.328      0.706      0.483      -0.426
0.890
hml            0.1227      0.235      0.522      0.604      -0.348
0.593
==============================================================================
Omnibus:                        2.525   Durbin-Watson:
2.604
Prob(Omnibus):                  0.283   Jarque-Bera (JB):
2.164
Skew:                          -0.465   Prob(JB):
0.339
Kurtosis:                       2.954   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   10866  20170131    CAL -0.063071  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.492
Model:                            OLS   Adj. R-squared:
0.465
Method:                 Least Squares   F-statistic:
18.07
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.52e-08
Time:                        02:52:01   Log-Likelihood:
36.473
No. Observations:                  60   AIC:
-64.95
Df Residuals:                      56   BIC:
-56.57
Df Model:                           3
```

```
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0086      0.019     -0.452      0.653      -0.047
0.030
mktrf          2.0110      0.404      4.973      0.000       1.201
2.821
smb            1.6910      0.704      2.401      0.020       0.280
3.102
hml            1.1020      0.504      2.188      0.033       0.093
2.111
==============================================================================
==========
Omnibus:                        1.963   Durbin-Watson:
2.628
Prob(Omnibus):                  0.375   Jarque-Bera (JB):
1.597
Skew:                           0.400   Prob(JB):
0.450
Kurtosis:                       2.985   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   10874  20170131     BC  0.097543  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.614
Model:                            OLS   Adj. R-squared:
0.594
Method:                 Least Squares   F-statistic:
29.73
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.25e-11
Time:                        02:52:01   Log-Likelihood:
78.575
No. Observations:                  60   AIC:
-149.2
Df Residuals:                      56   BIC:
-140.8
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0014      0.009     -0.151      0.880      -0.020
0.018
mktrf          1.4468      0.200      7.217      0.000       1.045
```

```
1.848
smb            0.9686      0.349      2.774      0.008       0.269
1.668
hml            0.3721      0.250      1.490      0.142      -0.128
0.872
==============================================================================
==========
Omnibus:                        0.861   Durbin-Watson:
2.211
Prob(Omnibus):                  0.650   Jarque-Bera (JB):
0.861
Skew:                          -0.097   Prob(JB):
0.650
Kurtosis:                       2.446   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   12366  20170131    BAH -0.062379  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.333
Model:                            OLS   Adj. R-squared:
0.298
Method:                 Least Squares   F-statistic:
9.339
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.21e-05
Time:                        02:52:01   Log-Likelihood:
94.508
No. Observations:                  60   AIC:
-181.0
Df Residuals:                      56   BIC:
-172.6
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0023      0.007      0.313      0.756      -0.012
0.017
mktrf          0.7647      0.154      4.974      0.000       0.457
1.073
smb           -0.2413      0.268     -0.901      0.371      -0.778
0.295
hml           -0.4860      0.191     -2.538      0.014      -0.870
-0.102
==============================================================================
==========
Omnibus:                        3.180   Durbin-Watson:
2.494
Prob(Omnibus):                  0.204   Jarque-Bera (JB):
```

```
2.512
Skew:                          -0.241   Prob(JB):
0.285
Kurtosis:                       3.879   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   12515  20170131    BKU  0.019103  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.724
Model:                            OLS   Adj. R-squared:
0.709
Method:                 Least Squares   F-statistic:
48.90
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.18e-15
Time:                        02:52:01   Log-Likelihood:
97.222
No. Observations:                  60   AIC:
-186.4
Df Residuals:                      56   BIC:
-178.1
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0026      0.007      0.369      0.714      -0.011
0.016
mktrf          0.9712      0.147      6.610      0.000       0.677
1.266
smb            0.8289      0.256      3.240      0.002       0.316
1.342
hml            1.1793      0.183      6.444      0.000       0.813
1.546
==============================================================================
==========
Omnibus:                        6.635   Durbin-Watson:
2.435
Prob(Omnibus):                  0.036   Jarque-Bera (JB):
5.745
Skew:                           0.641   Prob(JB):
0.0566
Kurtosis:                       3.809   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
```

```
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   13260  20170131   BCOV -0.10559  0.0194 -0.0113 -0.0274  0.0004

/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.164
Model:                            OLS   Adj. R-squared:
0.120
Method:                 Least Squares   F-statistic:
3.671
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0174
Time:                        02:52:01   Log-Likelihood:
40.212
No. Observations:                  60   AIC:
-72.42
Df Residuals:                      56   BIC:
-64.05
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0097      0.018      0.539      0.592      -0.026
0.046
mktrf          0.4539      0.380      1.195      0.237      -0.307
1.215
smb            1.3783      0.662      2.083      0.042       0.053
2.704
hml            0.5281      0.473      1.116      0.269      -0.420
1.476
==============================================================================
==========
Omnibus:                        5.859   Durbin-Watson:
2.039
Prob(Omnibus):                  0.053   Jarque-Bera (JB):
5.176
Skew:                           0.518   Prob(JB):
0.0752
Kurtosis:                       3.998   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   13548  20170131   BLMN -0.051026  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.423
Model:                            OLS   Adj. R-squared:
0.392
Method:                 Least Squares   F-statistic:
13.71
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
8.13e-07
Time:                        02:52:01   Log-Likelihood:
43.359
No. Observations:                60   AIC:
-78.72
Df Residuals:                    56   BIC:
-70.34
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0040      0.017     -0.234      0.816      -0.038
0.030
mktrf          1.8012      0.361      4.996      0.000       1.079
2.523
smb            0.6640      0.628      1.057      0.295      -0.594
1.922
hml            0.8201      0.449      1.826      0.073      -0.080
1.720
==============================================================================
==========
Omnibus:                       10.273   Durbin-Watson:
2.437
Prob(Omnibus):                  0.006   Jarque-Bera (JB):
11.678
Skew:                           0.716   Prob(JB):
0.00291
Kurtosis:                       4.619   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   13604  20170131   BERY  0.047199  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.503
Model:                            OLS   Adj. R-squared:
0.476
Method:                 Least Squares   F-statistic:
18.86
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.41e-08
Time:                        02:52:01   Log-Likelihood:
84.463
No. Observations:                60   AIC:
-160.9
Df Residuals:                    56   BIC:
-152.5
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0066      0.009     -0.767      0.446      -0.024
0.011
mktrf          1.2827      0.182      7.058      0.000       0.919
1.647
smb           -0.5694      0.317     -1.799      0.077      -1.203
0.065
hml            0.3247      0.226      1.434      0.157      -0.129
0.778
==========================================================================
==========
Omnibus:                        0.902   Durbin-Watson:
1.964
Prob(Omnibus):                  0.637   Jarque-Bera (JB):
0.321
Skew:                          -0.058   Prob(JB):
0.852
Kurtosis:                       3.339   Cond. No.
41.0
==========================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   13739  20170131   BFAM  0.011997  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==========================================================================
==========
Dep. Variable:                      y   R-squared:
0.239
Model:                            OLS   Adj. R-squared:
0.198
Method:                 Least Squares   F-statistic:
5.869
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.00147
Time:                        02:52:01   Log-Likelihood:
67.366
No. Observations:                  60   AIC:
-126.7
Df Residuals:                      56   BIC:
-118.4
Df Model:                           3
Covariance Type:            nonrobust
==========================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0005      0.011      0.045      0.964      -0.022
0.023
mktrf          0.9012      0.242      3.729      0.000       0.417
1.385
smb            0.2710      0.421      0.644      0.522      -0.572
```

```
1.114
hml            -0.0089       0.301     -0.030       0.977       -0.612
0.594
==============================================================================
==========
Omnibus:                        10.293   Durbin-Watson:
2.199
Prob(Omnibus):                   0.006   Jarque-Bera (JB):
12.072
Skew:                           -0.697   Prob(JB):
0.00239
Kurtosis:                        4.699   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   13766  20170131    BCC  0.102222  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.484
Model:                            OLS   Adj. R-squared:
0.457
Method:                 Least Squares   F-statistic:
17.53
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
3.79e-08
Time:                        02:52:01   Log-Likelihood:
62.219
No. Observations:                  60   AIC:
-116.4
Df Residuals:                      56   BIC:
-108.1
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0094      0.012      0.758      0.452      -0.015
0.034
mktrf          1.6082      0.263      6.108      0.000       1.081
2.136
smb            0.4573      0.459      0.997      0.323      -0.461
1.376
hml            0.4129      0.328      1.259      0.213      -0.244
1.070
==============================================================================
==========
Omnibus:                        2.487   Durbin-Watson:
2.232
Prob(Omnibus):                  0.288   Jarque-Bera (JB):
1.959
Skew:                           0.441   Prob(JB):
```

```
0.376
Kurtosis:                       3.083   Cond. No.
41.0
==============================================================================
==========


Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   13947  20170131   BLUE  0.207455  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.228
Model:                            OLS   Adj. R-squared:
0.186
Method:                 Least Squares   F-statistic:
5.506
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.00219
Time:                        02:52:01   Log-Likelihood:
34.676
No. Observations:                  60   AIC:
-61.35
Df Residuals:                      56   BIC:
-52.98
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0306      0.020     -1.556      0.125      -0.070
0.009
mktrf          1.4605      0.417      3.505      0.001       0.626
2.295
smb            0.6889      0.726      0.949      0.347      -0.765
2.143
hml           -0.1568      0.519     -0.302      0.764      -1.197
0.883
==============================================================================
==========
Omnibus:                        4.642   Durbin-Watson:
1.876
Prob(Omnibus):                  0.098   Jarque-Bera (JB):
4.489
Skew:                           0.309   Prob(JB):
0.106
Kurtosis:                       4.188   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   14149  20170131   BNFT  0.018518  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.292
Model:                            OLS   Adj. R-squared:
0.255
Method:                 Least Squares   F-statistic:
7.716
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000211
Time:                        02:52:01   Log-Likelihood:
36.491
No. Observations:                  60   AIC:
-64.98
Df Residuals:                      56   BIC:
-56.61
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0248      0.019     -1.301      0.198      -0.063
0.013
mktrf          1.3870      0.404      3.431      0.001       0.577
2.197
smb            1.4461      0.704      2.054      0.045       0.036
2.856
hml            0.1038      0.504      0.206      0.837      -0.905
1.113
==============================================================================
==========
Omnibus:                       13.215   Durbin-Watson:
2.178
Prob(Omnibus):                  0.001   Jarque-Bera (JB):
15.384
Skew:                           0.921   Prob(JB):
0.000456
Kurtosis:                       4.662   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14181  20170131    BRX -0.001229  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.625
Model:                            OLS   Adj. R-squared:
0.605
Method:                 Least Squares   F-statistic:
31.12
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.69e-12
Time:                        02:52:01   Log-Likelihood:
77.388
No. Observations:                  60   AIC:
-146.8
Df Residuals:                      56   BIC:
-138.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const         -0.0026      0.010     -0.270      0.788      -0.022
0.017
mktrf          1.3744      0.204      6.721      0.000       0.965
1.784
smb            0.8574      0.356      2.408      0.019       0.144
1.571
hml            0.8584      0.255      3.370      0.001       0.348
1.369
==============================================================================
Omnibus:                        0.264   Durbin-Watson:
2.558
Prob(Omnibus):                  0.876   Jarque-Bera (JB):
0.451
Skew:                          -0.084   Prob(JB):
0.798
Kurtosis:                       2.610   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14182  20170131   BURL -0.012389  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.261
Model:                            OLS   Adj. R-squared:
0.222
Method:                 Least Squares   F-statistic:
6.606
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000669
Time:                        02:52:01   Log-Likelihood:
75.096
No. Observations:                  60   AIC:
-142.2
Df Residuals:                      56   BIC:
-133.8
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0145      0.010      1.448      0.153      -0.006
0.035
mktrf          0.7330      0.212      3.450      0.001       0.307
1.159
smb            0.4091      0.370      1.106      0.274      -0.332
1.150
hml            0.2324      0.265      0.878      0.384      -0.298
0.763
==============================================================================
==========
Omnibus:                        2.059   Durbin-Watson:
2.254
Prob(Omnibus):                  0.357   Jarque-Bera (JB):
1.615
Skew:                           0.228   Prob(JB):
0.446
Kurtosis:                       2.338   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
is correctly specified.
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14500  20170131    BRG -0.039602  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                          y   R-squared:
0.159
Model:                                OLS   Adj. R-squared:
0.114
Method:                     Least Squares   F-statistic:
3.533
Date:                   Wed, 13 Apr 2022   Prob (F-statistic):
0.0204
Time:                           02:52:02   Log-Likelihood:
32.838
No. Observations:                      60   AIC:
-57.68
Df Residuals:                          56   BIC:
-49.30
Df Model:                               3
Covariance Type:               nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0251      0.020      1.238      0.221      -0.015
0.066
mktrf          0.6273      0.430      1.460      0.150      -0.233
1.488
smb            0.8780      0.748      1.173      0.246      -0.621
2.377
hml            0.9667      0.535      1.806      0.076      -0.105
2.039
==============================================================================
==========
Omnibus:                       52.102   Durbin-Watson:
1.462
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
336.805
Skew:                           2.240   Prob(JB):
7.31e-74
Kurtosis:                      13.708   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14543  20170131   BLBD  0.090615  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                          y   R-squared:
0.350
Model:                                OLS   Adj. R-squared:
0.316
Method:                     Least Squares   F-statistic:
```

```
10.06
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.10e-05
Time:                        02:52:02   Log-Likelihood:
54.994
No. Observations:                  60   AIC:
-102.0
Df Residuals:                      56   BIC:
-93.61
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const         -0.0005      0.014     -0.035      0.972      -0.029
0.028
mktrf          0.8559      0.297      2.882      0.006       0.261
1.451
smb            1.4248      0.517      2.755      0.008       0.389
2.461
hml            0.6221      0.370      1.682      0.098      -0.119
1.363
==============================================================================
Omnibus:                        4.698   Durbin-Watson:
2.283
Prob(Omnibus):                  0.095   Jarque-Bera (JB):
3.761
Skew:                          -0.479   Prob(JB):
0.153
Kurtosis:                       3.765   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14650  20170131   BWFG -0.098154  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.549
Model:                            OLS   Adj. R-squared:
0.524
Method:                 Least Squares   F-statistic:
22.69
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
9.63e-10
Time:                        02:52:02   Log-Likelihood:
83.083
No. Observations:                  60   AIC:
-158.2
Df Residuals:                      56   BIC:
-149.8
Df Model:                           3
```

```
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0089      0.009      1.012      0.316      -0.009
0.026
mktrf          0.4879      0.186      2.624      0.011       0.115
0.860
smb            0.7597      0.324      2.346      0.023       0.111
1.408
hml            1.3729      0.232      5.927      0.000       0.909
1.837
==============================================================================
==========
Omnibus:                        1.105   Durbin-Watson:
2.401
Prob(Omnibus):                  0.576   Jarque-Bera (JB):
0.460
Skew:                           0.011   Prob(JB):
0.794
Kurtosis:                       3.429   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   14925  20170131   BCLI  0.11811  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.041
Model:                            OLS   Adj. R-squared:
-0.010
Method:                 Least Squares   F-statistic:
0.8051
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.496
Time:                        02:52:02   Log-Likelihood:
8.9101
No. Observations:                  60   AIC:
-9.820
Df Residuals:                      56   BIC:
-1.443
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0229      0.030      0.757      0.452      -0.038
0.083
mktrf         -0.1093      0.640     -0.171      0.865      -1.392
```

```
1.173
smb            1.2445      1.115      1.116      0.269      -0.989
3.478
hml          -0.9804      0.797     -1.229      0.224      -2.578
0.617
======================================================================
==========
Omnibus:                        6.270   Durbin-Watson:
2.327
Prob(Omnibus):                  0.044   Jarque-Bera (JB):
6.519
Skew:                           0.440   Prob(JB):
0.0384
Kurtosis:                       4.354   Cond. No.
41.0
======================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml       rf
0   14951  20170131   BGSF -0.171154  0.0194 -0.0113 -0.0274  0.0004

/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.458
Model:                            OLS   Adj. R-squared:
0.429
Method:                 Least Squares   F-statistic:
15.76
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.51e-07
Time:                        02:52:02   Log-Likelihood:
40.642
No. Observations:                  60   AIC:
-73.28
Df Residuals:                      56   BIC:
-64.91
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0092      0.018     -0.514      0.609      -0.045
0.026
mktrf          1.9993      0.377      5.300      0.000       1.244
2.755
smb            1.2887      0.657      1.961      0.055      -0.027
2.605
hml            0.4997      0.470      1.063      0.292      -0.442
1.441
==============================================================================
==========
Omnibus:                        4.511   Durbin-Watson:
2.406
Prob(Omnibus):                  0.105   Jarque-Bera (JB):
3.581
Skew:                           0.560   Prob(JB):
0.167
Kurtosis:                       3.420   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14953  20170131   BOOT -0.133387  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.476
Model:                            OLS   Adj. R-squared:
0.448
Method:                 Least Squares   F-statistic:
16.98
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
5.78e-08
Time:                        02:52:02   Log-Likelihood:
31.060
No. Observations:                60   AIC:
-54.12
Df Residuals:                    56   BIC:
-45.74
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0267      0.021      1.277      0.207      -0.015
0.068
mktrf          2.4236      0.443      5.476      0.000       1.537
3.310
smb            1.7265      0.771      2.240      0.029       0.182
3.271
hml            0.4592      0.551      0.833      0.408      -0.645
1.564
==============================================================================
==========
Omnibus:                       41.553   Durbin-Watson:
2.102
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
175.948
Skew:                           1.847   Prob(JB):
6.21e-39
Kurtosis:                      10.532   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   14995  20170131   CALA  1.153846  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.110
Model:                            OLS   Adj. R-squared:
0.062
Method:                 Least Squares   F-statistic:
2.307
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0865
Time:                        02:52:02   Log-Likelihood:
-0.32105
No. Observations:                60   AIC:
8.642
Df Residuals:                    56   BIC:
17.02
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0325      0.035     -0.922      0.361      -0.103
0.038
mktrf          1.7918      0.747      2.400      0.020       0.296
3.288
smb           -0.0558      1.300     -0.043      0.966      -2.661
2.549
hml           -1.2432      0.930     -1.337      0.187      -3.106
0.620
==============================================================================
==========
Omnibus:                       36.197   Durbin-Watson:
1.331
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
121.588
Skew:                           1.666   Prob(JB):
3.96e-27
Kurtosis:                       9.127   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   15145  20170131    BOX  0.231602  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.306
Model:                            OLS   Adj. R-squared:
0.269
Method:                 Least Squares   F-statistic:
8.245
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000124
Time:                        02:52:02   Log-Likelihood:
59.071
No. Observations:                  60   AIC:
-110.1
Df Residuals:                      56   BIC:
-101.8
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0005      0.013     -0.042      0.967      -0.027
0.026
mktrf          1.2005      0.277      4.327      0.000       0.645
1.756
smb            0.3544      0.483      0.733      0.466      -0.614
```

```
1.322
hml            0.1352      0.346      0.391      0.697      -0.557
0.828
==============================================================================
==========
Omnibus:                        2.335   Durbin-Watson:
2.255
Prob(Omnibus):                  0.311   Jarque-Bera (JB):
2.024
Skew:                           0.448   Prob(JB):
0.364
Kurtosis:                       2.924   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   15284  20170131   BPMC  0.214973  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.149
Model:                            OLS   Adj. R-squared:
0.104
Method:                 Least Squares   F-statistic:
3.271
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0277
Time:                        02:52:02   Log-Likelihood:
37.756
No. Observations:                  60   AIC:
-67.51
Df Residuals:                      56   BIC:
-59.14
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0213      0.019      1.142      0.258      -0.016
0.059
mktrf          0.5616      0.396      1.419      0.161      -0.231
1.355
smb            1.5916      0.689      2.309      0.025       0.211
2.973
hml           -0.3179      0.493     -0.645      0.522      -1.306
0.670
==============================================================================
==========
Omnibus:                        0.211   Durbin-Watson:
2.011
Prob(Omnibus):                  0.900   Jarque-Bera (JB):
0.016
Skew:                           0.037   Prob(JB):
```

```
0.992
Kurtosis:                       3.027   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   15395  20170131   CABO  0.01713  0.0194 -0.0113 -0.0274  0.0004
                          OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.333
Model:                            OLS   Adj. R-squared:
0.297
Method:                 Least Squares   F-statistic:
9.324
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.27e-05
Time:                        02:52:02   Log-Likelihood:
88.516
No. Observations:                  60   AIC:
-169.0
Df Residuals:                      56   BIC:
-160.7
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0037      0.008      0.460      0.647      -0.012
0.020
mktrf          0.6659      0.170      3.920      0.000       0.326
1.006
smb           -0.1149      0.296     -0.389      0.699      -0.708
0.478
hml           -0.8680      0.212     -4.102      0.000      -1.292
-0.444
==============================================================================
==========
Omnibus:                        3.982   Durbin-Watson:
2.156
Prob(Omnibus):                  0.137   Jarque-Bera (JB):
2.216
Skew:                           0.216   Prob(JB):
0.330
Kurtosis:                       2.163   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   15397  20170131    BLD  0.042416  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.415
Model:                            OLS   Adj. R-squared:
0.384
Method:                 Least Squares   F-statistic:
13.24
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.20e-06
Time:                        02:52:02   Log-Likelihood:
64.618
No. Observations:                  60   AIC:
-121.2
Df Residuals:                      56   BIC:
-112.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0151      0.012      1.262      0.212      -0.009
0.039
mktrf          1.5162      0.253      5.993      0.000       1.009
2.023
smb            0.1218      0.441      0.276      0.783      -0.761
1.004
hml           -0.4092      0.315     -1.298      0.199      -1.040
0.222
==============================================================================
==========
Omnibus:                        0.865   Durbin-Watson:
1.725
Prob(Omnibus):                  0.649   Jarque-Bera (JB):
0.429
Skew:                          -0.192   Prob(JB):
0.807
Kurtosis:                       3.154   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   15996  20170131  BATRA -0.026354  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.459
Model:                            OLS   Adj. R-squared:
0.430
Method:                 Least Squares   F-statistic:
15.84
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.41e-07
Time:                        02:52:02   Log-Likelihood:
92.635
No. Observations:                  60   AIC:
-177.3
Df Residuals:                      56   BIC:
-168.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const         -0.0008      0.007     -0.105      0.917      -0.016
0.014
mktrf          0.7252      0.159      4.572      0.000       0.407
1.043
smb            0.7700      0.276      2.788      0.007       0.217
1.323
hml            0.2873      0.198      1.454      0.152      -0.108
0.683
==============================================================================
Omnibus:                        0.054   Durbin-Watson:
2.062
Prob(Omnibus):                  0.973   Jarque-Bera (JB):
0.054
Skew:                           0.045   Prob(JB):
0.973
Kurtosis:                       2.882   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   15997  20170131   BATRK -0.029626  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.469
Model:                            OLS   Adj. R-squared:
0.441
Method:                 Least Squares   F-statistic:
16.50
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
8.40e-08
Time:                        02:52:02   Log-Likelihood:
94.220
No. Observations:                  60   AIC:
-180.4
Df Residuals:                      56   BIC:
-172.1
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0017      0.007     -0.236      0.814      -0.016
0.013
mktrf          0.7391      0.154      4.785      0.000       0.430
1.049
smb            0.7470      0.269      2.777      0.007       0.208
1.286
hml            0.2592      0.192      1.347      0.183      -0.126
0.645
==============================================================================
==========
Omnibus:                        0.118   Durbin-Watson:
2.081
Prob(Omnibus):                  0.943   Jarque-Bera (JB):
0.076
Skew:                           0.075   Prob(JB):
0.963
Kurtosis:                       2.909   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   16381  20170131     BL -0.016287  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.296
Model:                            OLS   Adj. R-squared:
0.259
Method:                 Least Squares   F-statistic:
7.866
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
0.000181
Time:                        02:52:02   Log-Likelihood:
58.119
No. Observations:                60   AIC:
-108.2
Df Residuals:                    56   BIC:
-99.86
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0095      0.013      0.718      0.476      -0.017
0.036
mktrf          0.8000      0.282      2.838      0.006       0.235
1.365
smb            1.3495      0.491      2.749      0.008       0.366
2.333
hml           -0.9126      0.351     -2.599      0.012      -1.616
-0.209
==============================================================================
==========
Omnibus:                        6.992   Durbin-Watson:
2.501
Prob(Omnibus):                  0.030   Jarque-Bera (JB):
7.584
Skew:                           0.480   Prob(JB):
0.0225
Kurtosis:                       4.454   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   16505  20170131   BPOP  0.013921  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.624
Model:                            OLS   Adj. R-squared:
0.604
Method:                 Least Squares   F-statistic:
31.03
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.98e-12
Time:                        02:52:02   Log-Likelihood:
92.368
No. Observations:                60   AIC:
-176.7
Df Residuals:                    56   BIC:
-168.4
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0121      0.008      1.609      0.113      -0.003
0.027
mktrf          0.8568      0.159      5.378      0.000       0.538
1.176
smb            0.2616      0.277      0.943      0.350      -0.294
0.817
hml            1.2093      0.198      6.094      0.000       0.812
1.607
==============================================================================
==========
Omnibus:                        3.967   Durbin-Watson:
2.168
Prob(Omnibus):                  0.138   Jarque-Bera (JB):
4.059
Skew:                          -0.154   Prob(JB):
0.131
Kurtosis:                       4.236   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   16548  20170131    BOH -0.031345  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.719
Model:                            OLS   Adj. R-squared:
0.704
Method:                 Least Squares   F-statistic:
47.85
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.82e-15
Time:                        02:52:02   Log-Likelihood:
103.29
No. Observations:                  60   AIC:
-198.6
Df Residuals:                      56   BIC:
-190.2
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0026      0.006     -0.420      0.676      -0.015
0.010
mktrf          0.9341      0.133      7.034      0.000       0.668
1.200
smb            0.8596      0.231      3.717      0.000       0.396
```

```
1.323
hml            0.8832      0.165      5.340      0.000       0.552
1.215
==============================================================================
==========
Omnibus:                        6.808   Durbin-Watson:
1.690
Prob(Omnibus):                  0.033   Jarque-Bera (JB):
6.638
Skew:                           0.534   Prob(JB):
0.0362
Kurtosis:                       4.230   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   18649  20170131    BCO  0.078788  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.436
Model:                            OLS   Adj. R-squared:
0.405
Method:                 Least Squares   F-statistic:
14.41
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.51e-07
Time:                        02:52:02   Log-Likelihood:
58.394
No. Observations:                  60   AIC:
-108.8
Df Residuals:                      56   BIC:
-100.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0003      0.013     -0.024      0.981      -0.027
0.026
mktrf          1.4082      0.281      5.018      0.000       0.846
1.970
smb            0.5812      0.489      1.189      0.239      -0.398
1.560
hml            0.6878      0.350      1.968      0.054      -0.012
1.388
==============================================================================
==========
Omnibus:                       11.278   Durbin-Watson:
1.795
Prob(Omnibus):                  0.004   Jarque-Bera (JB):
27.464
Skew:                           0.335   Prob(JB):
```

```
1.09e-06
Kurtosis:                       6.246   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   18973  20170131    BRC -0.026498  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.283
Model:                            OLS   Adj. R-squared:
0.245
Method:                 Least Squares   F-statistic:
7.377
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000299
Time:                        02:52:02   Log-Likelihood:
83.145
No. Observations:                  60   AIC:
-158.3
Df Residuals:                      56   BIC:
-149.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0010      0.009      0.113      0.910      -0.017
0.019
mktrf          0.7202      0.186      3.877      0.000       0.348
1.092
smb            0.1677      0.324      0.518      0.606      -0.480
0.816
hml            0.2674      0.231      1.156      0.253      -0.196
0.731
==============================================================================
==========
Omnibus:                        1.305   Durbin-Watson:
2.574
Prob(Omnibus):                  0.521   Jarque-Bera (JB):
0.655
Skew:                           0.188   Prob(JB):
0.721
Kurtosis:                       3.348   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   19393  20170131    BMY -0.152122  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.160
Model:                            OLS   Adj. R-squared:
0.115
Method:                 Least Squares   F-statistic:
3.562
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0197
Time:                        02:52:02   Log-Likelihood:
81.711
No. Observations:                  60   AIC:
-155.4
Df Residuals:                      56   BIC:
-147.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0032      0.009     -0.355      0.724      -0.021
0.015
mktrf          0.5916      0.190      3.109      0.003       0.210
0.973
smb           -0.0656      0.331     -0.198      0.844      -0.729
0.598
hml            0.0339      0.237      0.143      0.887      -0.441
0.509
==============================================================================
==========
Omnibus:                        2.935   Durbin-Watson:
2.130
Prob(Omnibus):                  0.231   Jarque-Bera (JB):
2.326
Skew:                          -0.182   Prob(JB):
0.313
Kurtosis:                       3.893   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   19561  20170131     BA  0.049717  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.374
Model:                            OLS   Adj. R-squared:
0.340
Method:                 Least Squares   F-statistic:
11.14
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
7.76e-06
Time:                        02:52:02   Log-Likelihood:
54.423
No. Observations:                  60   AIC:
-100.8
Df Residuals:                      56   BIC:
-92.47
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const          0.0004      0.014      0.030      0.976      -0.028
0.029
mktrf          1.2890      0.300      4.299      0.000       0.688
1.890
smb            0.3208      0.522      0.614      0.542      -0.725
1.367
hml            0.8568      0.373      2.294      0.026       0.109
1.605
==============================================================================
Omnibus:                        1.499   Durbin-Watson:
2.241
Prob(Omnibus):                  0.473   Jarque-Bera (JB):
0.795
Skew:                           0.194   Prob(JB):
0.672
Kurtosis:                       3.409   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   20512  20170131   CACI -0.012068  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.376
Model:                            OLS   Adj. R-squared:
0.342
Method:                 Least Squares   F-statistic:
11.24
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
7.05e-06
Time:                        02:52:02   Log-Likelihood:
88.218
No. Observations:                  60   AIC:
-168.4
Df Residuals:                      56   BIC:
-160.1
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0016      0.008      0.198      0.844      -0.015
0.018
mktrf          0.9310      0.171      5.454      0.000       0.589
1.273
smb           -0.0217      0.297     -0.073      0.942      -0.617
0.574
hml            0.0505      0.213      0.238      0.813      -0.375
0.476
==============================================================================
==========
Omnibus:                        2.971   Durbin-Watson:
2.061
Prob(Omnibus):                  0.226   Jarque-Bera (JB):
2.536
Skew:                          -0.504   Prob(JB):
0.281
Kurtosis:                       2.997   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   20598  20170131   CALM -0.056027  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.078
Model:                            OLS   Adj. R-squared:
0.028
Method:                 Least Squares   F-statistic:
1.570
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.207
Time:                        02:52:02   Log-Likelihood:
77.728
No. Observations:                  60   AIC:
-147.5
Df Residuals:                      56   BIC:
-139.1
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0008      0.010     -0.087      0.931      -0.020
0.018
mktrf         -0.1853      0.203     -0.911      0.366      -0.593
0.222
smb            0.6105      0.354      1.724      0.090      -0.099
1.320
hml           -0.3431      0.253     -1.354      0.181      -0.850
0.164
==============================================================================
==========
Omnibus:                        6.378   Durbin-Watson:
2.092
Prob(Omnibus):                  0.041   Jarque-Bera (JB):
6.107
Skew:                           0.506   Prob(JB):
0.0472
Kurtosis:                       4.190   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   20670  20170131   CAMP  0.035862  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.604
Model:                            OLS   Adj. R-squared:
0.583
Method:                 Least Squares   F-statistic:
28.49
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
2.56e-11
Time:                        02:52:02   Log-Likelihood:
56.858
No. Observations:                60   AIC:
-105.7
Df Residuals:                    56   BIC:
-97.34
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0273      0.014     -2.014      0.049      -0.055
-0.000
mktrf          2.1300      0.288      7.398      0.000       1.553
2.707
smb            1.1062      0.501      2.206      0.031       0.102
2.111
hml            0.4943      0.359      1.378      0.174      -0.224
1.213
==============================================================================
==========
Omnibus:                        1.660   Durbin-Watson:
1.943
Prob(Omnibus):                  0.436   Jarque-Bera (JB):
0.930
Skew:                           0.221   Prob(JB):
0.628
Kurtosis:                       3.419   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   21371  20170131    CAH  0.041545  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.273
Model:                            OLS   Adj. R-squared:
0.234
Method:                 Least Squares   F-statistic:
7.013
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000436
Time:                        02:52:02   Log-Likelihood:
72.871
No. Observations:                60   AIC:
-137.7
Df Residuals:                    56   BIC:
-129.4
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0122      0.010     -1.170      0.247      -0.033
0.009
mktrf          0.9534      0.220      4.324      0.000       0.512
1.395
smb           -0.3786      0.384     -0.986      0.328      -1.148
0.391
hml            0.2154      0.275      0.784      0.436      -0.335
0.766
==============================================================================
==========
Omnibus:                        1.758   Durbin-Watson:
2.176
Prob(Omnibus):                  0.415   Jarque-Bera (JB):
1.471
Skew:                          -0.222   Prob(JB):
0.479
Kurtosis:                       2.375   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   27887  20170131    BAX  0.080514  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.228
Model:                            OLS   Adj. R-squared:
0.186
Method:                 Least Squares   F-statistic:
5.508
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.00219
Time:                        02:52:02   Log-Likelihood:
90.388
No. Observations:                  60   AIC:
-172.8
Df Residuals:                      56   BIC:
-164.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0019      0.008      0.251      0.803      -0.014
0.018
mktrf          0.6662      0.165      4.046      0.000       0.336
0.996
smb           -0.2667      0.287     -0.930      0.356      -0.841
```

```
0.308
hml            -0.2022      0.205     -0.986      0.329      -0.613
0.209
==============================================================================
==========
Omnibus:                        2.531   Durbin-Watson:
2.153
Prob(Omnibus):                  0.282   Jarque-Bera (JB):
1.675
Skew:                          -0.322   Prob(JB):
0.433
Kurtosis:                       3.505   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   33823  20170131   BOOM  0.006309  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.298
Model:                            OLS   Adj. R-squared:
0.261
Method:                 Least Squares   F-statistic:
7.932
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000170
Time:                        02:52:02   Log-Likelihood:
36.009
No. Observations:                  60   AIC:
-64.02
Df Residuals:                      56   BIC:
-55.64
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0223      0.019      1.162      0.250      -0.016
0.061
mktrf          0.6926      0.408      1.700      0.095      -0.124
1.509
smb            2.3333      0.710      3.288      0.002       0.911
3.755
hml            0.6753      0.508      1.330      0.189      -0.342
1.692
==============================================================================
==========
Omnibus:                       12.722   Durbin-Watson:
1.922
Prob(Omnibus):                  0.002   Jarque-Bera (JB):
13.343
Skew:                           1.088   Prob(JB):
```

```
0.00127
Kurtosis:                       3.774   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   37584  20170131    BEN  0.004042  0.0194 -0.0113 -0.0274  0.0004
                          OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.554
Model:                            OLS   Adj. R-squared:
0.530
Method:                 Least Squares   F-statistic:
23.19
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
6.90e-10
Time:                        02:52:02   Log-Likelihood:
90.376
No. Observations:                  60   AIC:
-172.8
Df Residuals:                      56   BIC:
-164.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0041      0.008     -0.525      0.602      -0.020
0.011
mktrf          0.9712      0.165      5.897      0.000       0.641
1.301
smb            0.1571      0.287      0.548      0.586      -0.417
0.732
hml            0.8174      0.205      3.985      0.000       0.406
1.228
==============================================================================
==========
Omnibus:                        0.596   Durbin-Watson:
2.285
Prob(Omnibus):                  0.742   Jarque-Bera (JB):
0.681
Skew:                          -0.010   Prob(JB):
0.712
Kurtosis:                       2.479   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   39642  20170131    BDX  0.070915  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.271
Model:                            OLS   Adj. R-squared:
0.232
Method:                 Least Squares   F-statistic:
6.951
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000466
Time:                        02:52:02   Log-Likelihood:
91.684
No. Observations:                  60   AIC:
-175.4
Df Residuals:                      56   BIC:
-167.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0025      0.008     -0.329      0.744      -0.018
0.013
mktrf          0.7345      0.161      4.559      0.000       0.412
1.057
smb           -0.2711      0.281     -0.966      0.338      -0.833
0.291
hml           -0.1437      0.201     -0.716      0.477      -0.546
0.258
==============================================================================
==========
Omnibus:                        9.506   Durbin-Watson:
2.817
Prob(Omnibus):                  0.009   Jarque-Bera (JB):
12.207
Skew:                          -0.583   Prob(JB):
0.00223
Kurtosis:                       4.877   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   39693  20170131      B  0.014973  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.445
Model:                            OLS   Adj. R-squared:
0.415
Method:                 Least Squares   F-statistic:
14.97
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.86e-07
Time:                        02:52:02   Log-Likelihood:
77.924
No. Observations:                  60   AIC:
-147.8
Df Residuals:                      56   BIC:
-139.5
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0070      0.010     -0.737      0.464      -0.026
0.012
mktrf          1.0050      0.203      4.959      0.000       0.599
1.411
smb            0.5754      0.353      1.630      0.109      -0.132
1.282
hml            0.4678      0.252      1.853      0.069      -0.038
0.974
==============================================================================
==========
Omnibus:                        5.262   Durbin-Watson:
1.963
Prob(Omnibus):                  0.072   Jarque-Bera (JB):
4.282
Skew:                          -0.550   Prob(JB):
0.118
Kurtosis:                       3.708   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   49656  20170131     BK -0.051921  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.650
Model:                            OLS   Adj. R-squared:
0.631
Method:                 Least Squares   F-statistic:
34.67
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
8.41e-13
Time:                        02:52:02   Log-Likelihood:
106.88
No. Observations:                  60   AIC:
-205.8
Df Residuals:                      56   BIC:
-197.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0033      0.006     -0.568      0.573      -0.015
0.008
mktrf          1.0288      0.125      8.225      0.000       0.778
1.279
smb           -0.0992      0.218     -0.455      0.651      -0.535
0.337
hml            0.6202      0.156      3.981      0.000       0.308
0.932
==============================================================================
==========
Omnibus:                        0.525   Durbin-Watson:
2.228
Prob(Omnibus):                  0.769   Jarque-Bera (JB):
0.613
Skew:                          -0.205   Prob(JB):
0.736
Kurtosis:                       2.721   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   53110  20170131    BMI  0.043302  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.331
Model:                            OLS   Adj. R-squared:
0.295
Method:                 Least Squares   F-statistic:
9.233
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
4.67e-05
Time:                        02:52:02   Log-Likelihood:
83.292
No. Observations:                60   AIC:
-158.6
Df Residuals:                    56   BIC:
-150.2
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0129      0.009      1.481      0.144      -0.005
0.030
mktrf          0.5803      0.185      3.131      0.003       0.209
0.952
smb            0.9513      0.323      2.948      0.005       0.305
1.598
hml            0.0655      0.231      0.284      0.778      -0.397
0.528
==============================================================================
==========
Omnibus:                        1.496   Durbin-Watson:
2.412
Prob(Omnibus):                  0.473   Jarque-Bera (JB):
0.792
Skew:                           0.042   Prob(JB):
0.673
Kurtosis:                       3.557   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   56274  20170131    CAG -0.006574  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.213
Model:                            OLS   Adj. R-squared:
0.171
Method:                 Least Squares   F-statistic:
5.062
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.00358
Time:                        02:52:02   Log-Likelihood:
70.521
No. Observations:                60   AIC:
-133.0
Df Residuals:                    56   BIC:
-124.7
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0072      0.011     -0.670      0.506      -0.029
0.014
mktrf          0.8248      0.229      3.597      0.001       0.366
1.284
smb           -0.5369      0.399     -1.345      0.184      -1.337
0.263
hml            0.2665      0.286      0.933      0.355      -0.306
0.839
==========================================================================
==========
Omnibus:                        7.808   Durbin-Watson:
1.844
Prob(Omnibus):                  0.020   Jarque-Bera (JB):
15.690
Skew:                           0.016   Prob(JB):
0.000392
Kurtosis:                       5.505   Cond. No.
41.0
==========================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   56856  20170131    BRT  0.03464  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==========================================================================
==========
Dep. Variable:                      y   R-squared:
0.304
Model:                            OLS   Adj. R-squared:
0.266
Method:                 Least Squares   F-statistic:
8.145
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000137
Time:                        02:52:02   Log-Likelihood:
57.580
No. Observations:                  60   AIC:
-107.2
Df Residuals:                      56   BIC:
-98.78
Df Model:                           3
Covariance Type:            nonrobust
==========================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0175      0.013      1.303      0.198      -0.009
0.044
mktrf          1.0567      0.284      3.715      0.000       0.487
1.627
smb            0.3247      0.495      0.655      0.515      -0.668
```

```
1.317
hml            0.6370      0.354      1.798      0.078      -0.073
1.347
==============================================================================
==========
Omnibus:                       11.104   Durbin-Watson:
2.633
Prob(Omnibus):                  0.004   Jarque-Bera (JB):
13.012
Skew:                           0.758   Prob(JB):
0.00149
Kurtosis:                       4.705   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   57568  20170131    BLL  0.015852  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.178
Model:                            OLS   Adj. R-squared:
0.134
Method:                 Least Squares   F-statistic:
4.031
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0115
Time:                        02:52:02   Log-Likelihood:
85.974
No. Observations:                  60   AIC:
-163.9
Df Residuals:                      56   BIC:
-155.6
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0068      0.008      0.813      0.420      -0.010
0.024
mktrf          0.5690      0.177      3.211      0.002       0.214
0.924
smb           -0.3890      0.309     -1.260      0.213      -1.007
0.229
hml           -0.3612      0.221     -1.636      0.107      -0.803
0.081
==============================================================================
==========
Omnibus:                       0.866   Durbin-Watson:
1.763
Prob(Omnibus):                 0.649   Jarque-Bera (JB):
0.885
Skew:                          0.269   Prob(JB):
```

```
0.643
Kurtosis:                       2.748   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   59408  20170131    BAC  0.024434  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.830
Model:                            OLS   Adj. R-squared:
0.821
Method:                 Least Squares   F-statistic:
91.29
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.51e-21
Time:                        02:52:02   Log-Likelihood:
118.95
No. Observations:                  60   AIC:
-229.9
Df Residuals:                      56   BIC:
-221.5
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0042      0.005      0.872      0.387      -0.005
0.014
mktrf          1.2973      0.102     12.684      0.000       1.092
1.502
smb           -0.1111      0.178     -0.624      0.535      -0.468
0.246
hml            0.9485      0.127      7.445      0.000       0.693
1.204
==============================================================================
==========
Omnibus:                        1.429   Durbin-Watson:
2.183
Prob(Omnibus):                  0.489   Jarque-Bera (JB):
1.103
Skew:                           0.052   Prob(JB):
0.576
Kurtosis:                       2.344   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   61946  20170131    BKH  0.019726  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.149
Model:                            OLS   Adj. R-squared:
0.104
Method:                 Least Squares   F-statistic:
3.280
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0274
Time:                        02:52:02   Log-Likelihood:
94.274
No. Observations:                  60   AIC:
-180.5
Df Residuals:                      56   BIC:
-172.2
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0013      0.007      0.183      0.856      -0.013
0.016
mktrf          0.4119      0.154      2.669      0.010       0.103
0.721
smb           -0.1928      0.269     -0.717      0.476      -0.731
0.346
hml            0.2296      0.192      1.195      0.237      -0.155
0.615
==============================================================================
==========
Omnibus:                        0.580   Durbin-Watson:
1.856
Prob(Omnibus):                  0.748   Jarque-Bera (JB):
0.711
Skew:                          -0.192   Prob(JB):
0.701
Kurtosis:                       2.630   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   62156  20170131   BXMT  0.013967  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.649
Model:                            OLS   Adj. R-squared:
0.630
Method:                 Least Squares   F-statistic:
34.52
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
9.12e-13
Time:                        02:52:02   Log-Likelihood:
96.051
No. Observations:                  60   AIC:
-184.1
Df Residuals:                      56   BIC:
-175.7
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0009      0.007     -0.127      0.900      -0.015
0.013
mktrf          1.1593      0.150      7.738      0.000       0.859
1.459
smb            0.2658      0.261      1.019      0.313      -0.257
0.789
hml            0.7111      0.187      3.810      0.000       0.337
1.085
==============================================================================
==========
Omnibus:                       17.549   Durbin-Watson:
2.696
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
32.756
Skew:                          -0.906   Prob(JB):
7.71e-08
Kurtosis:                       6.134   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   63467  20170131    BRO -0.060856  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.361
Model:                            OLS   Adj. R-squared:
0.327
Method:                 Least Squares   F-statistic:
10.55
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.34e-05
Time:                        02:52:02   Log-Likelihood:
100.81
No. Observations:                  60   AIC:
-193.6
Df Residuals:                      56   BIC:
-185.2
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0098      0.007      1.499      0.139      -0.003
0.023
mktrf          0.7621      0.138      5.506      0.000       0.485
1.039
smb           -0.5471      0.241     -2.270      0.027      -1.030
-0.064
hml            0.0171      0.172      0.099      0.921      -0.328
0.362
==============================================================================
==========
Omnibus:                        0.294   Durbin-Watson:
2.276
Prob(Omnibus):                  0.863   Jarque-Bera (JB):
0.034
Skew:                           0.046   Prob(JB):
0.983
Kurtosis:                       3.072   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   67467  20170131    BIG -0.004182  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.328
Model:                            OLS   Adj. R-squared:
0.292
Method:                 Least Squares   F-statistic:
9.098
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.32e-05
Time:                        02:52:02   Log-Likelihood:
30.356
No. Observations:                  60   AIC:
-52.71
Df Residuals:                      56   BIC:
-44.33
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0161      0.021     -0.762      0.449      -0.058
0.026
mktrf          2.0496      0.448      4.577      0.000       1.153
2.947
```

```
smb            0.8194      0.780       1.051       0.298       -0.743
2.382
hml           -0.1687      0.558      -0.302       0.763       -1.286
0.949
==============================================================================
==========
Omnibus:                       20.724   Durbin-Watson:
1.772
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
30.581
Skew:                           1.258   Prob(JB):
2.29e-07
Kurtosis:                       5.429   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   70121  20170131    BDN -0.015142  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.509
Model:                            OLS   Adj. R-squared:
0.482
Method:                 Least Squares   F-statistic:
19.33
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
9.96e-09
Time:                        02:52:03   Log-Likelihood:
91.365
No. Observations:                  60   AIC:
-174.7
Df Residuals:                      56   BIC:
-166.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0086      0.008     -1.129       0.264      -0.024
0.007
mktrf          1.0223      0.162      6.311       0.000       0.698
1.347
smb            0.1223      0.282      0.433       0.666      -0.443
0.687
hml            0.4352      0.202      2.157       0.035       0.031
0.839
==============================================================================
==========
Omnibus:                       5.527   Durbin-Watson:
2.576
Prob(Omnibus):                 0.063   Jarque-Bera (JB):
5.890
```

```
Skew:                          -0.347   Prob(JB):
0.0526
Kurtosis:                       4.369   Cond. No.
41.0
================================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   70519  20170131      C -0.060575  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
================================================================================
==========
Dep. Variable:                      y   R-squared:
0.781
Model:                            OLS   Adj. R-squared:
0.770
Method:                 Least Squares   F-statistic:
66.71
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.75e-18
Time:                        02:52:03   Log-Likelihood:
98.465
No. Observations:                  60   AIC:
-188.9
Df Residuals:                      56   BIC:
-180.6
Df Model:                           3
Covariance Type:            nonrobust
================================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
--------------------------------------------------------------------------------
----------
const         -0.0078      0.007     -1.150      0.255      -0.021
0.006
mktrf          1.5345      0.144     10.662      0.000       1.246
1.823
smb            0.3036      0.251      1.211      0.231      -0.199
0.806
hml            1.0044      0.179      5.603      0.000       0.645
1.364
================================================================================
==========
Omnibus:                        0.533   Durbin-Watson:
1.800
Prob(Omnibus):                  0.766   Jarque-Bera (JB):
0.281
Skew:                          -0.167   Prob(JB):
0.869
Kurtosis:                       3.030   Cond. No.
41.0
================================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
```

```
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   76038  20170131   BLFS  0.148854  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.250
Model:                            OLS   Adj. R-squared:
0.210
Method:                 Least Squares   F-statistic:
6.226
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.00100
Time:                        02:52:03   Log-Likelihood:
19.117
No. Observations:                  60   AIC:
-30.23
Df Residuals:                      56   BIC:
-21.86
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0391      0.025      1.535      0.130      -0.012
0.090
mktrf          1.5602      0.540      2.889      0.005       0.478
2.642
smb            1.9562      0.941      2.080      0.042       0.072
3.840
hml           -1.4934      0.673     -2.220      0.030      -2.841
-0.146
==============================================================================
==========
Omnibus:                       15.178   Durbin-Watson:
1.928
Prob(Omnibus):                  0.001   Jarque-Bera (JB):
17.863
Skew:                           1.066   Prob(JB):
0.000132
Kurtosis:                       4.613   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   76224  20170131    BHE  0.003279  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.438
Model:                            OLS   Adj. R-squared:
0.407
Method:                 Least Squares   F-statistic:
14.52
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.11e-07
Time:                        02:52:03   Log-Likelihood:
77.202
No. Observations:                  60   AIC:
-146.4
Df Residuals:                      56   BIC:
-138.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0024      0.010     -0.244      0.808      -0.022
0.017
mktrf          0.7462      0.205      3.638      0.001       0.335
1.157
smb            0.8798      0.357      2.463      0.017       0.164
1.595
hml            0.7224      0.256      2.828      0.006       0.211
1.234
==============================================================================
==========
Omnibus:                        1.995   Durbin-Watson:
1.992
Prob(Omnibus):                  0.369   Jarque-Bera (JB):
1.244
Skew:                          -0.303   Prob(JB):
0.537
Kurtosis:                       3.362   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   76841  20170131   BIIB -0.022357  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.086
Model:                            OLS   Adj. R-squared:
0.037
Method:                 Least Squares   F-statistic:
1.752
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
0.167
Time:                        02:52:03   Log-Likelihood:
56.629
No. Observations:                60   AIC:
-105.3
Df Residuals:                    56   BIC:
-96.88
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0067      0.014     -0.492      0.625      -0.034
0.021
mktrf          0.4203      0.289      1.454      0.151      -0.159
0.999
smb            0.5726      0.503      1.138      0.260      -0.436
1.581
hml           -0.4661      0.360     -1.295      0.201      -1.187
0.255
==============================================================================
==========
Omnibus:                        4.066   Durbin-Watson:
1.981
Prob(Omnibus):                  0.131   Jarque-Bera (JB):
3.957
Skew:                           0.221   Prob(JB):
0.138
Kurtosis:                       4.178   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   76892  20170131   BOKF -0.009634  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.797
Model:                            OLS   Adj. R-squared:
0.786
Method:                 Least Squares   F-statistic:
73.15
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.30e-19
Time:                        02:52:03   Log-Likelihood:
105.08
No. Observations:                60   AIC:
-202.2
Df Residuals:                    56   BIC:
-193.8
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0028      0.006      0.465      0.644      -0.009
0.015
mktrf          1.0858      0.129      8.424      0.000       0.828
1.344
smb            1.0290      0.224      4.585      0.000       0.579
1.479
hml            1.1163      0.161      6.953      0.000       0.795
1.438
==============================================================================
==========
Omnibus:                        2.464   Durbin-Watson:
2.230
Prob(Omnibus):                  0.292   Jarque-Bera (JB):
2.274
Skew:                           0.391   Prob(JB):
0.321
Kurtosis:                       2.453   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   77584  20170131    BKE -0.028509  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.392
Model:                            OLS   Adj. R-squared:
0.360
Method:                 Least Squares   F-statistic:
12.04
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
3.43e-06
Time:                        02:52:03   Log-Likelihood:
53.357
No. Observations:                  60   AIC:
-98.71
Df Residuals:                      56   BIC:
-90.34
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0242      0.014      1.678      0.099      -0.005
0.053
mktrf          0.6145      0.305      2.013      0.049       0.003
1.226
smb            2.2335      0.532      4.202      0.000       1.169
```

```
3.298
hml            0.5559      0.380      1.462      0.149      -0.206
1.317
==============================================================================
==========
Omnibus:                        9.577   Durbin-Watson:
2.123
Prob(Omnibus):                  0.008   Jarque-Bera (JB):
9.365
Skew:                           0.792   Prob(JB):
0.00926
Kurtosis:                       4.112   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   77605  20170131    BSX  0.112344  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.338
Model:                            OLS   Adj. R-squared:
0.303
Method:                 Least Squares   F-statistic:
9.546
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
3.45e-05
Time:                        02:52:03   Log-Likelihood:
90.117
No. Observations:                  60   AIC:
-172.2
Df Residuals:                      56   BIC:
-163.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0006      0.008     -0.072      0.943      -0.016
0.015
mktrf          0.8675      0.165      5.245      0.000       0.536
1.199
smb           -0.1452      0.288     -0.504      0.616      -0.722
0.432
hml           -0.1002      0.206     -0.486      0.629      -0.513
0.313
==============================================================================
==========
Omnibus:                        2.181   Durbin-Watson:
1.860
Prob(Omnibus):                  0.336   Jarque-Bera (JB):
1.801
Skew:                          -0.280   Prob(JB):
```

```
0.406
Kurtosis:                       2.363   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   77659  20170131   BBBY -0.007136  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.291
Model:                            OLS   Adj. R-squared:
0.253
Method:                 Least Squares   F-statistic:
7.647
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000227
Time:                        02:52:03   Log-Likelihood:
14.176
No. Observations:                  60   AIC:
-20.35
Df Residuals:                      56   BIC:
-11.97
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0046      0.028     -0.165      0.870      -0.060
0.051
mktrf          1.1411      0.586      1.946      0.057      -0.034
2.316
smb            3.5079      1.021      3.435      0.001       1.462
5.554
hml            0.2782      0.730      0.381      0.705      -1.185
1.741
==============================================================================
==========
Omnibus:                       12.895   Durbin-Watson:
2.289
Prob(Omnibus):                  0.002   Jarque-Bera (JB):
18.962
Skew:                           0.744   Prob(JB):
7.63e-05
Kurtosis:                       5.318   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   77660  20170131   CACC -0.056227  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.332
Model:                            OLS   Adj. R-squared:
0.296
Method:                 Least Squares   F-statistic:
9.273
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.49e-05
Time:                        02:52:03   Log-Likelihood:
66.673
No. Observations:                  60   AIC:
-125.3
Df Residuals:                      56   BIC:
-117.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0125      0.012      1.080      0.285      -0.011
0.036
mktrf          0.9902      0.244      4.050      0.000       0.500
1.480
smb            0.4750      0.426      1.116      0.269      -0.378
1.328
hml            0.4140      0.305      1.360      0.179      -0.196
1.024
==============================================================================
==========
Omnibus:                        4.784   Durbin-Watson:
1.662
Prob(Omnibus):                  0.091   Jarque-Bera (JB):
3.814
Skew:                          -0.503   Prob(JB):
0.148
Kurtosis:                       3.717   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   77902  20170131   CAKE  0.006346  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.582
Model:                            OLS   Adj. R-squared:
0.560
Method:                 Least Squares   F-statistic:
26.02
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.13e-10
Time:                        02:52:03   Log-Likelihood:
70.011
No. Observations:                  60   AIC:
-132.0
Df Residuals:                      56   BIC:
-123.6
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0085      0.011     -0.784      0.436      -0.030
0.013
mktrf          1.2412      0.231      5.368      0.000       0.778
1.704
smb            1.1477      0.403      2.850      0.006       0.341
1.954
hml            1.0338      0.288      3.589      0.001       0.457
1.611
==============================================================================
==========
Omnibus:                        2.583   Durbin-Watson:
2.249
Prob(Omnibus):                  0.275   Jarque-Bera (JB):
1.969
Skew:                          -0.438   Prob(JB):
0.374
Kurtosis:                       3.148   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
```

	PERMNO	date	TICKER	RET	mktrf	smb	hml	rf
0	77920	20170131	BLX	-0.06301	0.0194	-0.0113	-0.0274	0.0004

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.623
Model:                            OLS   Adj. R-squared:
0.603
Method:                 Least Squares   F-statistic:
30.83
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
6.67e-12
Time:                        02:52:03   Log-Likelihood:
90.550
No. Observations:                  60   AIC:
-173.1
Df Residuals:                      56   BIC:
-164.7
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const         -0.0105      0.008     -1.353      0.181      -0.026
0.005
mktrf          1.1121      0.164      6.772      0.000       0.783
1.441
smb            0.4996      0.286      1.747      0.086      -0.073
1.072
hml            0.7831      0.205      3.829      0.000       0.373
1.193
==============================================================================
Omnibus:                        0.894   Durbin-Watson:
1.838
Prob(Omnibus):                  0.640   Jarque-Bera (JB):
0.581
Skew:                          -0.240   Prob(JB):
0.748
Kurtosis:                       3.037   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   79072  20170131   BANF  0.013971  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.772
Model:                            OLS   Adj. R-squared:
0.760
Method:                 Least Squares   F-statistic:
63.28
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
5.47e-18
Time:                        02:52:03   Log-Likelihood:
106.92
No. Observations:                60   AIC:
-205.8
Df Residuals:                    56   BIC:
-197.5
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0049      0.006      0.833      0.408      -0.007
0.017
mktrf          1.0459      0.125      8.367      0.000       0.795
1.296
smb            0.6190      0.218      2.843      0.006       0.183
1.055
hml            1.0920      0.156      7.013      0.000       0.780
1.404
==============================================================================
==========
Omnibus:                        3.807   Durbin-Watson:
2.174
Prob(Omnibus):                  0.149   Jarque-Bera (JB):
3.063
Skew:                          -0.542   Prob(JB):
0.216
Kurtosis:                       3.224   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   79249  20170131   BBSI -0.062246  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.477
Model:                            OLS   Adj. R-squared:
0.449
Method:                 Least Squares   F-statistic:
17.03
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.57e-08
Time:                        02:52:03   Log-Likelihood:
69.214
No. Observations:                60   AIC:
-130.4
Df Residuals:                    56   BIC:
-122.1
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0054      0.011     -0.491      0.625      -0.028
0.017
mktrf          1.2616      0.234      5.384      0.000       0.792
1.731
smb            0.5226      0.408      1.281      0.206      -0.295
1.340
hml            0.6660      0.292      2.282      0.026       0.081
1.251
==========================================================================
==========
Omnibus:                        1.050   Durbin-Watson:
1.838
Prob(Omnibus):                  0.592   Jarque-Bera (JB):
0.426
Skew:                           0.076   Prob(JB):
0.808
Kurtosis:                       3.384   Cond. No.
41.0
==========================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   79545  20170131    BWA  0.035243  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==========================================================================
==========
Dep. Variable:                      y   R-squared:
0.594
Model:                            OLS   Adj. R-squared:
0.572
Method:                 Least Squares   F-statistic:
27.28
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.25e-11
Time:                        02:52:03   Log-Likelihood:
85.360
No. Observations:                  60   AIC:
-162.7
Df Residuals:                      56   BIC:
-154.3
Df Model:                           3
Covariance Type:            nonrobust
==========================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0063      0.008     -0.750      0.457      -0.023
0.011
mktrf          1.2712      0.179      7.100      0.000       0.913
1.630
smb            0.2892      0.312      0.927      0.358      -0.335
```

```
0.914
hml            0.6666      0.223      2.989      0.004       0.220
1.113
==============================================================================
==========
Omnibus:                        3.334   Durbin-Watson:
2.258
Prob(Omnibus):                  0.189   Jarque-Bera (JB):
2.560
Skew:                          -0.489   Prob(JB):
0.278
Kurtosis:                       3.260   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   79558  20170131    BFS -0.039183  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.499
Model:                            OLS   Adj. R-squared:
0.472
Method:                 Least Squares   F-statistic:
18.59
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.72e-08
Time:                        02:52:03   Log-Likelihood:
85.629
No. Observations:                  60   AIC:
-163.3
Df Residuals:                      56   BIC:
-154.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0041      0.008     -0.488      0.628      -0.021
0.013
mktrf          0.8637      0.178      4.846      0.000       0.507
1.221
smb            0.4499      0.310      1.449      0.153      -0.172
1.072
hml            0.7726      0.222      3.480      0.001       0.328
1.217
==============================================================================
==========
Omnibus:                        0.260   Durbin-Watson:
2.017
Prob(Omnibus):                  0.878   Jarque-Bera (JB):
0.451
Skew:                           0.041   Prob(JB):
```

```
0.798
Kurtosis:                       2.583   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   79668  20170131    BDC  0.022736  0.0194 -0.0113 -0.0274  0.0004
                          OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.359
Model:                            OLS   Adj. R-squared:
0.324
Method:                 Least Squares   F-statistic:
10.44
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.47e-05
Time:                        02:52:03   Log-Likelihood:
61.312
No. Observations:                  60   AIC:
-114.6
Df Residuals:                      56   BIC:
-106.2
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0106      0.013     -0.844      0.402      -0.036
0.015
mktrf          1.1428      0.267      4.275      0.000       0.607
1.678
smb            0.7553      0.466      1.623      0.110      -0.177
1.688
hml            0.3075      0.333      0.924      0.360      -0.360
0.975
==============================================================================
==========
Omnibus:                        0.739   Durbin-Watson:
2.314
Prob(Omnibus):                  0.691   Jarque-Bera (JB):
0.544
Skew:                          -0.232   Prob(JB):
0.762
Kurtosis:                       2.957   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   79758  20170131    BYD  0.007437  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.608
Model:                            OLS   Adj. R-squared:
0.587
Method:                 Least Squares   F-statistic:
28.92
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.99e-11
Time:                        02:52:03   Log-Likelihood:
67.174
No. Observations:                  60   AIC:
-126.3
Df Residuals:                      56   BIC:
-118.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0051      0.011      0.448      0.656      -0.018
0.028
mktrf          1.8339      0.242      7.565      0.000       1.348
2.320
smb            0.8230      0.422      1.949      0.056      -0.023
1.669
hml            0.4486      0.302      1.486      0.143      -0.156
1.054
==============================================================================
==========
Omnibus:                        5.210   Durbin-Watson:
2.361
Prob(Omnibus):                  0.074   Jarque-Bera (JB):
4.807
Skew:                           0.693   Prob(JB):
0.0904
Kurtosis:                       3.026   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   80193  20170131    BZH  0.07218  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.456
Model:                            OLS   Adj. R-squared:
0.427
Method:                 Least Squares   F-statistic:
15.66
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.63e-07
Time:                        02:52:03   Log-Likelihood:
48.266
No. Observations:                  60   AIC:
-88.53
Df Residuals:                      56   BIC:
-80.15
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0049      0.016      0.315      0.754      -0.026
0.036
mktrf          1.6298      0.332      4.906      0.000       0.964
2.295
smb            0.6301      0.579      1.089      0.281      -0.529
1.789
hml            1.1327      0.414      2.737      0.008       0.304
1.962
==============================================================================
==========
Omnibus:                        5.351   Durbin-Watson:
1.906
Prob(Omnibus):                  0.069   Jarque-Bera (JB):
4.449
Skew:                           0.634   Prob(JB):
0.108
Kurtosis:                       3.416   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
```

	PERMNO	date	TICKER	RET	mktrf	smb	hml	rf
0	80306	20170131	BCRX	-0.004739	0.0194	-0.0113	-0.0274	0.0004

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.394
Model:                            OLS   Adj. R-squared:
0.361
Method:                 Least Squares   F-statistic:
12.13
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
3.17e-06
Time:                        02:52:03   Log-Likelihood:
20.906
No. Observations:                  60   AIC:
-33.81
Df Residuals:                      56   BIC:
-25.43
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0101      0.025      0.409      0.684      -0.039
0.060
mktrf          1.9747      0.524      3.767      0.000       0.925
3.025
smb            2.7787      0.913      3.044      0.004       0.950
4.607
hml            0.4419      0.653      0.677      0.501      -0.866
1.750
==============================================================================
==========
Omnibus:                       10.225   Durbin-Watson:
1.913
Prob(Omnibus):                  0.006   Jarque-Bera (JB):
11.106
Skew:                           0.745   Prob(JB):
0.00388
Kurtosis:                       4.490   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   82575  20170131   BANR  0.009676  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.658
Model:                            OLS   Adj. R-squared:
0.640
Method:                 Least Squares   F-statistic:
35.96
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
4.33e-13
Time:                        02:52:03   Log-Likelihood:
99.072
No. Observations:                60   AIC:
-190.1
Df Residuals:                    56   BIC:
-181.8
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0015      0.007      0.230      0.819      -0.012
0.015
mktrf          0.8436      0.142      5.921      0.000       0.558
1.129
smb            0.7126      0.248      2.872      0.006       0.216
1.210
hml            0.9159      0.177      5.161      0.000       0.560
1.271
==============================================================================
==========
Omnibus:                        0.890   Durbin-Watson:
2.761
Prob(Omnibus):                  0.641   Jarque-Bera (JB):
0.306
Skew:                          -0.010   Prob(JB):
0.858
Kurtosis:                       3.349   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   84062  20170131   BJRI -0.09542  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.412
Model:                            OLS   Adj. R-squared:
0.381
Method:                 Least Squares   F-statistic:
13.10
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.36e-06
Time:                        02:52:03   Log-Likelihood:
38.853
No. Observations:                60   AIC:
-69.71
Df Residuals:                    56   BIC:
-61.33
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0097      0.018     -0.530      0.599      -0.046
0.027
mktrf          1.8152      0.389      4.670      0.000       1.037
2.594
smb            1.2668      0.677      1.871      0.067      -0.089
2.623
hml            0.5956      0.484      1.230      0.224      -0.374
1.565
==========================================================================
==========
Omnibus:                       13.279   Durbin-Watson:
2.127
Prob(Omnibus):                  0.001   Jarque-Bera (JB):
16.879
Skew:                           0.858   Prob(JB):
0.000216
Kurtosis:                       4.951   Cond. No.
41.0
==========================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   85058  20170131    BXP  0.040706  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==========================================================================
==========
Dep. Variable:                      y   R-squared:
0.519
Model:                            OLS   Adj. R-squared:
0.493
Method:                 Least Squares   F-statistic:
20.15
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
5.55e-09
Time:                        02:52:03   Log-Likelihood:
88.889
No. Observations:                  60   AIC:
-169.8
Df Residuals:                      56   BIC:
-161.4
Df Model:                           3
Covariance Type:            nonrobust
==========================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0063      0.008     -0.790      0.433      -0.022
0.010
mktrf          1.0108      0.169      5.988      0.000       0.673
1.349
smb            0.1025      0.294      0.349      0.729      -0.486
```

```
0.691
hml            0.6499      0.210      3.090      0.003       0.229
1.071
==============================================================================
==========
Omnibus:                       13.405   Durbin-Watson:
2.500
Prob(Omnibus):                  0.001   Jarque-Bera (JB):
22.787
Skew:                           0.698   Prob(JB):
1.13e-05
Kurtosis:                       5.677   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   85259  20170131    BAM  0.047561  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.564
Model:                            OLS   Adj. R-squared:
0.541
Method:                 Least Squares   F-statistic:
24.15
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
3.70e-10
Time:                        02:52:03   Log-Likelihood:
92.601
No. Observations:                  60   AIC:
-177.2
Df Residuals:                      56   BIC:
-168.8
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0059      0.007      0.788      0.434      -0.009
0.021
mktrf          1.1922      0.159      7.513      0.000       0.874
1.510
smb           -0.0251      0.276     -0.091      0.928      -0.579
0.528
hml            0.3637      0.198      1.840      0.071      -0.032
0.760
==============================================================================
==========
Omnibus:                       13.196   Durbin-Watson:
2.554
Prob(Omnibus):                  0.001   Jarque-Bera (JB):
24.745
Skew:                           0.632   Prob(JB):
```

```
4.23e-06
Kurtosis:                       5.881   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   85332  20170131    BHB -0.084513  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.460
Model:                            OLS   Adj. R-squared:
0.431
Method:                 Least Squares   F-statistic:
15.92
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.33e-07
Time:                        02:52:03   Log-Likelihood:
80.881
No. Observations:                  60   AIC:
-153.8
Df Residuals:                      56   BIC:
-145.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0016      0.009      0.179      0.858      -0.017
0.020
mktrf          0.5778      0.193      2.995      0.004       0.191
0.964
smb            1.0704      0.336      3.186      0.002       0.397
1.743
hml            0.7828      0.240      3.257      0.002       0.301
1.264
==============================================================================
==========
Omnibus:                       12.342   Durbin-Watson:
2.455
Prob(Omnibus):                  0.002   Jarque-Bera (JB):
14.967
Skew:                           0.824   Prob(JB):
0.000562
Kurtosis:                       4.808   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   85418  20170131    CAC -0.061642  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.670
Model:                            OLS   Adj. R-squared:
0.652
Method:                 Least Squares   F-statistic:
37.91
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.64e-13
Time:                        02:52:03   Log-Likelihood:
108.96
No. Observations:                  60   AIC:
-209.9
Df Residuals:                      56   BIC:
-201.5
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0020      0.006      0.352      0.726      -0.009
0.013
mktrf          0.6486      0.121      5.368      0.000       0.407
0.891
smb            0.8098      0.210      3.849      0.000       0.388
1.231
hml            0.7984      0.150      5.305      0.000       0.497
1.100
==============================================================================
==========
Omnibus:                        5.723   Durbin-Watson:
2.337
Prob(Omnibus):                  0.057   Jarque-Bera (JB):
4.987
Skew:                           0.516   Prob(JB):
0.0826
Kurtosis:                       3.965   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   85860  20170131   BRKL -0.039634  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.622
Model:                            OLS   Adj. R-squared:
0.602
Method:                 Least Squares   F-statistic:
30.77
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
6.92e-12
Time:                        02:52:03   Log-Likelihood:
103.68
No. Observations:                  60   AIC:
-199.4
Df Residuals:                      56   BIC:
-191.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0046      0.006      0.746      0.459      -0.008
0.017
mktrf          0.4413      0.132      3.345      0.001       0.177
0.706
smb            0.9148      0.230      3.982      0.000       0.455
1.375
hml            0.9427      0.164      5.736      0.000       0.614
1.272
==============================================================================
==========
Omnibus:                       17.056   Durbin-Watson:
2.235
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
27.300
Skew:                          -0.962   Prob(JB):
1.18e-06
Kurtosis:                       5.687   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   85914  20170131    BBY  0.043356  0.0194 -0.0113 -0.0274  0.0004
                           OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.456
Model:                            OLS   Adj. R-squared:
0.427
Method:                 Least Squares   F-statistic:
15.63
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.67e-07
Time:                        02:52:03   Log-Likelihood:
69.831
No. Observations:                  60   AIC:
-131.7
Df Residuals:                      56   BIC:
-123.3
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0007      0.011      0.061      0.952      -0.021
0.023
mktrf          1.4951      0.232      6.446      0.000       1.030
1.960
smb           -0.1368      0.404     -0.339      0.736      -0.946
0.672
hml            0.1440      0.289      0.498      0.620      -0.435
0.723
==============================================================================
==========
Omnibus:                        0.728   Durbin-Watson:
2.363
Prob(Omnibus):                  0.695   Jarque-Bera (JB):
0.681
Skew:                          -0.247   Prob(JB):
0.711
Kurtosis:                       2.832   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   86124  20170131   BMTC -0.04484  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.642
Model:                            OLS   Adj. R-squared:
0.623
Method:                 Least Squares   F-statistic:
33.47
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.58e-12
Time:                        02:52:03   Log-Likelihood:
102.06
No. Observations:                  60   AIC:
-196.1
Df Residuals:                      56   BIC:
-187.7
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0064      0.006      0.997      0.323      -0.006
0.019
mktrf          0.5123      0.136      3.780      0.000       0.241
0.784
smb            0.6328      0.236      2.681      0.010       0.160
1.106
hml            1.1617      0.169      6.881      0.000       0.823
1.500
==============================================================================
==========
Omnibus:                        6.781   Durbin-Watson:
1.953
Prob(Omnibus):                  0.034   Jarque-Bera (JB):
6.111
Skew:                           0.600   Prob(JB):
0.0471
Kurtosis:                       4.003   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   86242  20170131  BELFB  0.031392  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.314
Model:                            OLS   Adj. R-squared:
0.277
Method:                 Least Squares   F-statistic:
8.548
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
9.14e-05
Time:                        02:52:03   Log-Likelihood:
39.268
No. Observations:                60   AIC:
-70.54
Df Residuals:                    56   BIC:
-62.16
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0129      0.018     -0.708      0.482      -0.049
0.024
mktrf          1.2131      0.386      3.143      0.003       0.440
1.986
smb            1.1858      0.672      1.764      0.083      -0.161
2.532
hml            0.8754      0.481      1.821      0.074      -0.088
1.839
==============================================================================
==========
Omnibus:                        3.285   Durbin-Watson:
2.364
Prob(Omnibus):                  0.193   Jarque-Bera (JB):
2.544
Skew:                          -0.281   Prob(JB):
0.280
Kurtosis:                       3.838   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER      RET   mktrf     smb     hml      rf
0   86382  20170131   BUSE -0.04386  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.726
Model:                            OLS   Adj. R-squared:
0.711
Method:                 Least Squares   F-statistic:
49.38
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
9.68e-16
Time:                        02:52:03   Log-Likelihood:
112.83
No. Observations:                60   AIC:
-217.7
Df Residuals:                    56   BIC:
-209.3
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0009      0.005     -0.167      0.868      -0.012
0.010
mktrf          0.7279      0.113      6.426      0.000       0.501
0.955
smb            0.6068      0.197      3.076      0.003       0.212
1.002
hml            0.9661      0.141      6.847      0.000       0.683
1.249
==========================================================================
==========
Omnibus:                        1.251   Durbin-Watson:
2.868
Prob(Omnibus):                  0.535   Jarque-Bera (JB):
0.598
Skew:                          -0.158   Prob(JB):
0.741
Kurtosis:                       3.373   Cond. No.
41.0
==========================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   86544  20170131   BCOR  0.023729  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==========================================================================
==========
Dep. Variable:                      y   R-squared:
0.423
Model:                            OLS   Adj. R-squared:
0.392
Method:                 Least Squares   F-statistic:
13.66
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
8.43e-07
Time:                        02:52:03   Log-Likelihood:
51.780
No. Observations:                  60   AIC:
-95.56
Df Residuals:                      56   BIC:
-87.18
Df Model:                           3
Covariance Type:            nonrobust
==========================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const         -0.0053      0.015     -0.359      0.721      -0.035
0.024
mktrf          1.3372      0.313      4.268      0.000       0.710
1.965
smb            1.5347      0.546      2.812      0.007       0.442
```

```
2.628
hml            0.3592      0.390      0.920      0.361      -0.423
1.141
==============================================================================
==========
Omnibus:                       12.486   Durbin-Watson:
1.951
Prob(Omnibus):                  0.002   Jarque-Bera (JB):
15.909
Skew:                           0.801   Prob(JB):
0.000351
Kurtosis:                       4.948   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   87014  20170131   BSRR  0.011659  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.675
Model:                            OLS   Adj. R-squared:
0.657
Method:                 Least Squares   F-statistic:
38.75
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.09e-13
Time:                        02:52:03   Log-Likelihood:
100.43
No. Observations:                  60   AIC:
-192.9
Df Residuals:                      56   BIC:
-184.5
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const       5.085e-05      0.007      0.008      0.994      -0.013
0.013
mktrf          0.9071      0.139      6.513      0.000       0.628
1.186
smb            0.2896      0.243      1.194      0.238      -0.196
0.775
hml            1.0776      0.173      6.212      0.000       0.730
1.425
==============================================================================
==========
Omnibus:                       5.666   Durbin-Watson:
2.409
Prob(Omnibus):                 0.059   Jarque-Bera (JB):
7.926
Skew:                          0.141   Prob(JB):
```

```
0.0190
Kurtosis:                       4.758   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   87056  20170131   BMRN  0.057822  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.177
Model:                            OLS   Adj. R-squared:
0.132
Method:                 Least Squares   F-statistic:
4.003
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.0119
Time:                        02:52:03   Log-Likelihood:
69.601
No. Observations:                  60   AIC:
-131.2
Df Residuals:                      56   BIC:
-122.8
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0049      0.011     -0.447      0.657      -0.027
0.017
mktrf          0.4165      0.233      1.789      0.079      -0.050
0.883
smb            0.9318      0.405      2.298      0.025       0.120
1.744
hml           -0.4390      0.290     -1.514      0.136      -1.020
0.142
==============================================================================
==========
Omnibus:                       47.403   Durbin-Watson:
1.981
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
243.341
Skew:                          -2.087   Prob(JB):
1.44e-53
Kurtosis:                      11.939   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   87267  20170131    BLK -0.017239  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.616
Model:                            OLS   Adj. R-squared:
0.596
Method:                 Least Squares   F-statistic:
30.01
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.06e-11
Time:                        02:52:03   Log-Likelihood:
105.99
No. Observations:                  60   AIC:
-204.0
Df Residuals:                      56   BIC:
-195.6
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0027      0.006      0.449      0.655      -0.009
0.015
mktrf          1.1426      0.127      9.001      0.000       0.888
1.397
smb           -0.1983      0.221     -0.897      0.374      -0.641
0.245
hml            0.1288      0.158      0.815      0.419      -0.188
0.446
==============================================================================
==========
Omnibus:                        0.758   Durbin-Watson:
2.354
Prob(Omnibus):                  0.684   Jarque-Bera (JB):
0.695
Skew:                           0.252   Prob(JB):
0.706
Kurtosis:                       2.843   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   87476  20170131   BMRC -0.036559  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.500
Model:                            OLS   Adj. R-squared:
0.474
Method:                 Least Squares   F-statistic:
18.69
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.60e-08
Time:                        02:52:03   Log-Likelihood:
101.68
No. Observations:                  60   AIC:
-195.4
Df Residuals:                      56   BIC:
-187.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0009      0.006      0.147      0.884      -0.012
0.014
mktrf          0.5642      0.136      4.137      0.000       0.291
0.837
smb            0.4633      0.238      1.951      0.056      -0.013
0.939
hml            0.6746      0.170      3.970      0.000       0.334
1.015
==============================================================================
==========
Omnibus:                        0.077   Durbin-Watson:
1.982
Prob(Omnibus):                  0.962   Jarque-Bera (JB):
0.151
Skew:                           0.080   Prob(JB):
0.927
Kurtosis:                       2.812   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   87487  20170131   BGCP  0.082111  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.607
Model:                            OLS   Adj. R-squared:
0.586
Method:                 Least Squares   F-statistic:
28.85
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.07e-11
Time:                        02:52:03   Log-Likelihood:
66.762
No. Observations:                  60   AIC:
-125.5
Df Residuals:                      56   BIC:
-117.1
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0030      0.012     -0.260      0.796      -0.026
0.020
mktrf          1.4386      0.244      5.893      0.000       0.950
1.928
smb            0.6434      0.425      1.514      0.136      -0.208
1.495
hml            1.4400      0.304      4.736      0.000       0.831
2.049
==============================================================================
==========
Omnibus:                        0.958   Durbin-Watson:
2.038
Prob(Omnibus):                  0.619   Jarque-Bera (JB):
0.419
Skew:                          -0.160   Prob(JB):
0.811
Kurtosis:                       3.256   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   88280  20170131   BHLB -0.039349  0.0194 -0.0113 -0.0274  0.0004
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

```
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.539
Model:                            OLS   Adj. R-squared:
0.515
Method:                 Least Squares   F-statistic:
21.87
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.68e-09
Time:                        02:52:03   Log-Likelihood:
65.381
No. Observations:                  60   AIC:
-122.8
Df Residuals:                      56   BIC:
-114.4
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0081      0.012      0.684      0.497      -0.016
0.032
mktrf          0.6635      0.250      2.656      0.010       0.163
1.164
smb            1.2285      0.435      2.824      0.007       0.357
2.100
hml            1.6795      0.311      5.398      0.000       1.056
2.303
==============================================================================
==========
Omnibus:                       28.528   Durbin-Watson:
2.038
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
82.080
Skew:                          -1.309   Prob(JB):
1.50e-18
Kurtosis:                       8.097   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   88504  20170131   BRKR  0.120397  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.483
Model:                            OLS   Adj. R-squared:
0.455
Method:                 Least Squares   F-statistic:
17.42
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
```

```
4.12e-08
Time:                        02:52:04   Log-Likelihood:
86.270
No. Observations:                60   AIC:
-164.5
Df Residuals:                    56   BIC:
-156.2
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0099      0.008      1.189      0.240      -0.007
0.027
mktrf          1.1459      0.176      6.498      0.000       0.793
1.499
smb            0.2405      0.307      0.783      0.437      -0.375
0.856
hml            0.0529      0.220      0.241      0.810      -0.387
0.493
==============================================================================
==========
Omnibus:                        0.588   Durbin-Watson:
1.861
Prob(Omnibus):                  0.745   Jarque-Bera (JB):
0.170
Skew:                           0.093   Prob(JB):
0.919
Kurtosis:                       3.182   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   89138  20170131     BG -0.041944  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.288
Model:                            OLS   Adj. R-squared:
0.250
Method:                 Least Squares   F-statistic:
7.568
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.000246
Time:                        02:52:04   Log-Likelihood:
80.360
No. Observations:                60   AIC:
-152.7
Df Residuals:                    56   BIC:
-144.3
Df Model:                         3
Covariance Type:            nonrobust
==============================================================================
```

```
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0071      0.009      0.778      0.440      -0.011
0.026
mktrf          0.5234      0.195      2.690      0.009       0.134
0.913
smb           -0.2149      0.339     -0.634      0.529      -0.894
0.464
hml            0.8212      0.242      3.388      0.001       0.336
1.307
==============================================================================
==========
Omnibus:                       16.335   Durbin-Watson:
2.200
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
20.253
Skew:                           1.101   Prob(JB):
4.00e-05
Kurtosis:                       4.803   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   89445  20170131   BDSI  0.114286  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.089
Model:                            OLS   Adj. R-squared:
0.041
Method:                 Least Squares   F-statistic:
1.831
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
0.152
Time:                        02:52:04   Log-Likelihood:
34.396
No. Observations:                  60   AIC:
-60.79
Df Residuals:                      56   BIC:
-52.41
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------
----------
const          0.0076      0.020      0.386      0.701      -0.032
0.047
mktrf          0.7392      0.419      1.766      0.083      -0.099
1.578
smb            0.7024      0.729      0.963      0.339      -0.758
```

```
2.163
hml           -0.0925      0.521     -0.177      0.860      -1.137
0.952
==============================================================================
==========
Omnibus:                        4.878   Durbin-Watson:
2.104
Prob(Omnibus):                  0.087   Jarque-Bera (JB):
3.898
Skew:                           0.568   Prob(JB):
0.142
Kurtosis:                       3.519   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   89482  20170131   BANC -0.089337  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.647
Model:                            OLS   Adj. R-squared:
0.628
Method:                 Least Squares   F-statistic:
34.16
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.10e-12
Time:                        02:52:04   Log-Likelihood:
76.425
No. Observations:                  60   AIC:
-144.8
Df Residuals:                      56   BIC:
-136.5
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0012      0.010     -0.127      0.900      -0.021
0.018
mktrf          1.2308      0.208      5.923      0.000       0.815
1.647
smb            1.6232      0.362      4.486      0.000       0.898
2.348
hml            0.7729      0.259      2.986      0.004       0.254
1.291
==============================================================================
==========
Omnibus:                        7.433   Durbin-Watson:
2.291
Prob(Omnibus):                  0.024   Jarque-Bera (JB):
7.312
Skew:                           0.586   Prob(JB):
```

```
0.0258
Kurtosis:                       4.246   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   90276  20170131   BLKB  0.025156  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.368
Model:                            OLS   Adj. R-squared:
0.334
Method:                 Least Squares   F-statistic:
10.85
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
1.01e-05
Time:                        02:52:04   Log-Likelihood:
80.010
No. Observations:                  60   AIC:
-152.0
Df Residuals:                      56   BIC:
-143.6
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0072      0.009     -0.776      0.441      -0.026
0.011
mktrf          0.9313      0.196      4.758      0.000       0.539
1.323
smb            0.5310      0.341      1.558      0.125      -0.152
1.214
hml           -0.0471      0.244     -0.193      0.848      -0.535
0.441
==============================================================================
==========
Omnibus:                        2.229   Durbin-Watson:
1.883
Prob(Omnibus):                  0.328   Jarque-Bera (JB):
1.423
Skew:                          -0.311   Prob(JB):
0.491
Kurtosis:                       3.428   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
```

```
0   90353  20170131   BECN -0.049924  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.636
Model:                            OLS   Adj. R-squared:
0.616
Method:                 Least Squares   F-statistic:
32.56
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
2.58e-12
Time:                        02:52:04   Log-Likelihood:
72.145
No. Observations:                  60   AIC:
-136.3
Df Residuals:                      56   BIC:
-127.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const         -0.0078      0.011     -0.745      0.460      -0.029
0.013
mktrf          1.7747      0.223      7.953      0.000       1.328
2.222
smb            0.0886      0.389      0.228      0.820      -0.690
0.867
hml            0.9715      0.278      3.495      0.001       0.415
1.528
==============================================================================
==========
Omnibus:                        1.720   Durbin-Watson:
1.760
Prob(Omnibus):                  0.423   Jarque-Bera (JB):
1.114
Skew:                           0.316   Prob(JB):
0.573
Kurtosis:                       3.212   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   90718  20170131   BFIN -0.091093  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
==========
Dep. Variable:                      y   R-squared:
0.329
Model:                            OLS   Adj. R-squared:
0.294
Method:                 Least Squares   F-statistic:
9.170
```

```
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
4.96e-05
Time:                        02:52:04   Log-Likelihood:
90.170
No. Observations:                  60   AIC:
-172.3
Df Residuals:                      56   BIC:
-164.0
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
const         -0.0039      0.008     -0.502      0.617      -0.020
0.012
mktrf          0.4364      0.165      2.641      0.011       0.105
0.767
smb            0.5762      0.288      2.002      0.050      -0.000
1.153
hml            0.5149      0.206      2.502      0.015       0.103
0.927
==============================================================================
Omnibus:                        0.472   Durbin-Watson:
2.173
Prob(Omnibus):                  0.790   Jarque-Bera (JB):
0.553
Skew:                          -0.196   Prob(JB):
0.758
Kurtosis:                       2.740   Cond. No.
41.0
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
 is correctly specified.
   PERMNO      date TICKER       RET   mktrf     smb     hml      rf
0   90720  20170131   BLDR -0.019143  0.0194 -0.0113 -0.0274  0.0004
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:
0.552
Model:                            OLS   Adj. R-squared:
0.528
Method:                 Least Squares   F-statistic:
23.01
Date:                Wed, 13 Apr 2022   Prob (F-statistic):
7.78e-10
Time:                        02:52:04   Log-Likelihood:
57.931
No. Observations:                  60   AIC:
-107.9
Df Residuals:                      56   BIC:
-99.49
Df Model:                           3
Covariance Type:            nonrobust
```

```
==============================================================================
==========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----------
const          0.0166      0.013      1.244      0.219      -0.010
0.043
mktrf          2.0912      0.283      7.394      0.000       1.525
2.658
smb            0.2496      0.493      0.507      0.614      -0.737
1.236
hml            0.3778      0.352      1.072      0.288      -0.328
1.083
==============================================================================
==========
Omnibus:                        1.190   Durbin-Watson:
1.759
Prob(Omnibus):                  0.551   Jarque-Bera (JB):
1.168
Skew:                           0.318   Prob(JB):
0.558
Kurtosis:                       2.750   Cond. No.
41.0
==============================================================================
==========

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors
is correctly specified.
```

```
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
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  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
/usr/local/lib/python3.7/dist-packages/statsmodels/tsa/tsatools.py:1
17: FutureWarning: In a future version of pandas all arguments of co
ncat except for the argument 'objs' will be keyword-only
  x = pd.concat(x[::order], 1)
```

In [10]:

```
# Integrate the data into dataframe
df = pd.DataFrame({"ticker":ticker,
                   "r_squared":r_squared,
                   "adj_r_squared":adj_r_squared,
                   "alpha":alpha,
                   "bata_mktrf":bata_mktrf,
                   "bata_smb":bata_smb,
                   "bata_hml":bata_hml})
```

In [11]:

```
df
```

Out[11]:

	ticker	r_squared	adj_r_squared	alpha	bata_mktrf	bata_smb	bata_hml
0	BWXT	0.319518	0.283063	-0.008452	1.035051	-0.255460	-0.025344
1	BCPC	0.151024	0.105543	0.007626	0.477501	0.231980	0.122664
2	CAL	0.491911	0.464692	-0.008616	2.010956	1.691033	1.102032
3	BC	0.614279	0.593615	-0.001431	1.446841	0.968595	0.372144
4	BAH	0.333477	0.297770	0.002267	0.764677	-0.241293	-0.486009
...	...	...	...	...	...	...	...
95	BANC	0.646651	0.627721	-0.001240	1.230841	1.623205	0.772896
96	BLKB	0.367581	0.333701	-0.007162	0.931270	0.530980	-0.047068
97	BECN	0.635610	0.616089	-0.007835	1.774667	0.088601	0.971480
98	BFIN	0.329431	0.293508	-0.003914	0.436431	0.576216	0.514933
99	BLDR	0.552135	0.528142	0.016584	2.091193	0.249562	0.377770

100 rows × 7 columns

In [12]:

```
# Save the final output to .csv file
df.to_csv('/content/Assign3-Output.csv')
```