# Assignment 1 : Review OLS

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(a) From CAPM, determine top 3 mutual fund in term of their performance based on Jensen Alpha.

The top 3 mutual funds are 4, 6, and 8.

(b) From FF, determine top 3 mutual fund in term of their performance based on Jensen Alpha.

The top 3 mutual funds are 4, 5, and 6.

(c) From Carhart, determine top 3 mutual fund in term of their performance based on Jensen Alpha.

The top 3 mutual funds are 3, 5, and 17.

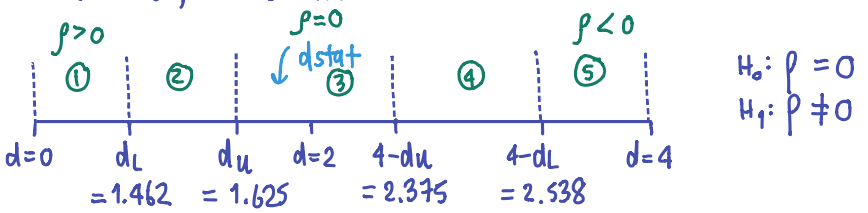
(d) From the estimated result of Carhart four-factor model (3) of mutual fund #1, evaluate whether there exist Autocorrelation and Multicollinearity problem or not? Which model between Carhart or FF should be employed in this case? Why? Also, make evaluation of the estimated results of Carhart model in term of (i) sign and meaning of the estimated coefficients; (ii) overall test; (iii) coefficient of determination; and (iv) individual test.

- Carhart model of mutual fund #1,

$$r_{jt} = .7177 + 88.3744 r_{mt} - 30.5552 r_{smbt} - 29.5542 r_{hmlt} - 16.8964 r_{wmlt}$$

- Evaluation of Autocorrelation :

Test by using Durbin-Watson test → d stat = 2.349188
At 0.02 significance level, the Durbin-Watson table




The d-stat falls into the area which doesn't reject $H_0$; thus, there exists no autocorrelation problem at 0.02 significance level.

- Evaluation of Multicollinearity :
  There exist a sign of serious multicollinearity due to the significant of the overall F-test, but the $r_{wmlt}$ t-test aren't significant.
  Moreover, when I incorporate the VIF into the analysis to check whether that insignificant t-test is caused from serious multicolinearity, I found that it doesn't stem from multicolinearity. The problem is due to the variable itself. Thus, $r_{wmlt}$ should be dropped.

$n=124$ At 5%.

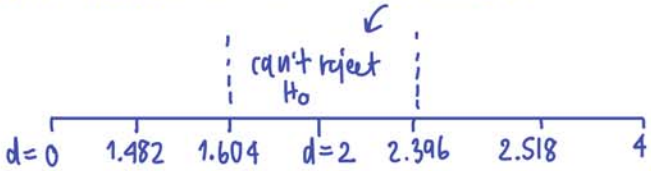
| Variable | VIF | t | t-test result | t-test × $\sqrt{VIF}$ |
|---|---|---|---|---|
| $r_{mt}$ | 11.39 | 21.39 | significant | |
| $r_{smbt}$ | 10.87 | −2.01 | significant | |
| $r_{hmlt}$ | 1.18 | −2.03 | significant | |
| $r_{wmlt}$ | 1.00 | −1.43 | insignificant | $\lvert -1.43 \rvert < 2$ |

∴ The model that should be employed is FF.

To support that conclusion, I will looke at the issue of autocorrelation, significance (F-test & t-test), and serious multicolinearity for FF.

Autocorrelation

The durbin-watson d-stat is 2.342202.




$H_0: \rho = 0$
$H_1: \rho \neq 0$

Thus, there exist no autocorrelation at 0.02 significant level.

Significance

Both the F-test and each individual t-test show that every variable is significant.

Serious multicollinearity

There exist no sign of serious multicolinearity when looke at the F-test and individual t-test.
However, when I employ the pairwise correlation test, the result is as follow...

| | $r_{jt}$ | $r_{mt}$ | $r_{smbt}$ | $r_{hmlt}$ |
|---|---|---|---|---|
| $r_{jt}$ | 1.000 | | | |
| $r_{mt}$ | 0.9 | 1.000 | | |
| $r_{smbt}$ | 0.3065 | 0.3499 | 1.000 | |
| $r_{hmlt}$ | −0.2709 | −0.2829 | −0.9514 | 1.000 |

→ $r_{smbt}$ correlation with $r_{mt}$, $r_{hmlt}$ correlation with $r_{mt}$, and $r_{hmlt}$ correlation with $r_{smbt}$ are stronger than their correlation with $r_{jt}$.
Thus, these are signals of serious multicolinearity.

Conclusion

Even there exist a signal of multicollinearity, it's okay. There is no unexplainability in the dependent variables and autocorrelation problem in the FF model. Thus, FF should be employed in this case.

- Evaluation of estimated results of Carhart model:

i) Sign : → The ⊕ sign for $r_{mt}$ coefficient means that the mutual fund's excess return overperform the market portfolio at time t.

→ The ⊖ sign for $r_{smbt}$, $r_{hmlt}$, and $r_{wmlt}$ means that the mutual fund's excess return underperform the return on the small minus big, high minus low, and winners minus losers portfolio.

Meaning of estimated coefficients :

$\beta_{j1}$ → When $r_{mt}$ increases by 1 unit, on average, $r_{jt}$ will increase 88.3744 unit.

$\beta_{j2}$ → When $r_{smbt}$ increases by 1 unit, on average, $r_{jt}$ will decrease 30.5552 unit.

$\beta_{j3}$ → When $r_{hmlt}$ increases by 1 unit, on average, $r_{jt}$ will decrease 29.5542 unit.

$\beta_{j4}$ → When $r_{wmlt}$ increases by 1 unit, on average, $r_{jt}$ will decrease 16.8964 unit.

(ii) Overall test :
The Prob > F = 0.000, thus it means that we can reject $H_0$.
The coefficients are overall significant.

(iii) Coefficient of determination ($R^2$) :
$R^2$ = 0.8198, meaning that the dependent variables can explain $r_{jt}$ by 81.98%, which is more than 50%. Thus, it can explain y relatively well.

(iv) Individual test :

$r_{mt}$ : p-value = 0.000 → $r_{mt}$ is significant because we can reject $H_0$ at any % level.

$r_{smbt}$ : p-value = 0.047 → $r_{mt}$ is significant because we can reject $H_0$ at 5% level.

$r_{hmlt}$ : p-value = 0.045 → $r_{mt}$ is significant because we can reject $H_0$ at 5% level.

$r_{wmlt}$ : p-value = 0.157 → $r_{wmlt}$ is insignificant because we can't reject $H_0$ at 5% or 10% level.

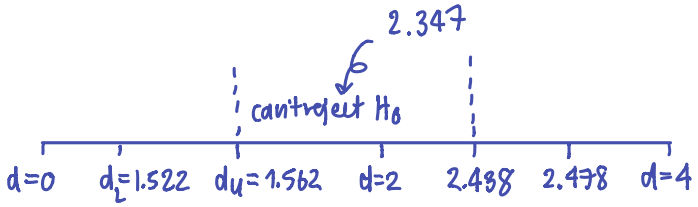
(e) Based on (a), (b), and (c), which result is the most appropriated one? Why?

(b) result is most appropriated one because FF is the best model among the three models ( CAPM , FF , and carhart ).

I have already compared FF and carhart in question (d) and found out that FF is better. Thus, the only comparison left is between CAPM and FF.

I found that the CAPM model has no autocorrelation at 2% significant level from the d-statistic of 2.347853.** Moreover, the coefficient of the independent variable is significant. However, comparing the adjusted $R^2$, CAPM has a lower Adjusted-$R^2$ than FF. CAPM's adj-$R^2$ is 0.8084 while FF's adj-$R^2$ is 0.8119.

**




$H_0 : \rho = 0$
$H_1 : \rho \neq 0$

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
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                                       979-696-4601 (fax)

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  Notes:
        1.  Unicode is supported; see help unicode_advice.
        2.  More than 2 billion observations are allowed; see help obs_advice.
        3.  Maximum number of variables is set to 5000; see help set_maxvar.
        4.  New update available; type -update all-

1 . use "C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.dta"

2 . log using "C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.2.smcl"
-------------------------------------------------------------------------------
      name:  <unnamed>
       log:  C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.2.smcl
  log type:  smcl
 opened on:  26 Jan 2021, 08:29:34

3 . do "C:\Users\user\AppData\Local\Temp\STD27b4_000000.tmp"

4 . set more off

5 . mat Alpha_CAPM=(0,9999)

6 . forvalue i=1(1)20 {
    2.  qui reg r`i' rmrf
    3.  est store capm`i'
    4.  mat beta=e(b)
    5.  sca a_capm`i'=el(beta,1,2)
    6.  mat Alpha_CAPM=(Alpha_CAPM \ `i',a_capm`i')
    7. }

7 . est table capm*, star(.1 .05 .01) stat(N rss F r2 r2_a)
```

| Variable | capm1 | capm2 | capm3 | capm4 | capm5 |
|---|---|---|---|---|---|
| rmrf | 86.67481*** | .33259034 | 79.458292*** | 71.566194*** | 89.883716*** |
| _cons | -.28045261 | .02705237 | .04241345 | .41910739* | .1533913 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 408.66469 | 17.49366 | 608.13953 | 723.83913 | 444.17823 |
| F | 503.19828 | .17308485 | 284.18142 | 193.68422 | 497.88063 |
| r2 | .81004455 | .00146467 | .70660007 | .6214117 | .80840443 |
| r2_a | .80843476 | -.00699749 | .70411363 | .61820332 | .80678074 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | capm6 | capm7 | capm8 | capm9 | capm10 |
|---|---|---|---|---|---|
| rmrf | 68.863747*** | 99.202503*** | 101.10416*** | 10.99266*** | 95.818659*** |
| _cons | .2460271* | .06639442 | .22738701 | .03444878 | .15557323 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 259.81331 | 347.73031 | 406.34169 | 95.443848 | 1155.1959 |
| F | 499.62062 | 774.68148 | 688.60011 | 34.655976 | 217.55296 |
| r2 | .8089442 | .86781399 | .85370694 | .22702011 | .64834165 |
| r2_a | .80732509 | .86669377 | .85246717 | .22046943 | .64536149 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | capm11 | capm12 | capm13 | capm14 | capm15 |
|---|---|---|---|---|---|
| rmrf | 92.431281*** | 103.15122*** | 95.215162*** | 95.059925*** | 99.733614*** |
| _cons | .19464246 | .03145185 | .13681104 | .17849533 | .09946436 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 425.2018 | 298.82029 | 273.31705 | 271.52934 | 1344.5332 |
| F | 550.00079 | 974.67347 | 907.9584 | 910.95859 | 202.50328 |
| r2 | .8233535 | .89200799 | .88498559 | .88532094 | .63182904 |
| r2_a | .8218565 | .89109281 | .88401089 | .88434909 | .62870894 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | capm16 | capm17 | capm18 | capm19 | capm20 |
|---|---|---|---|---|---|
| rmrf | 96.735158*** | 103.90009*** | 91.703867*** | 91.012912*** | 90.702947*** |
| _cons | .02742681 | .03352088 | .09933407 | .00020766 | .04748425 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 431.54133 | 2003.3903 | 368.5193 | 513.53595 | 501.25227 |
| F | 593.56291 | 147.49821 | 624.64823 | 441.52533 | 449.26947 |
| r2 | .83416786 | .55555256 | .84110916 | .78910696 | .79198598 |
| r2_a | .8327625 | .55178605 | .83976263 | .78731973 | .79022315 |

legend: * p<.1; ** p<.05; *** p<.01

```
 8 . mat list Alpha_CAPM

Alpha_CAPM[21,2]
              c1          c2
 r1            0        9999
 r2            1  -.28045261
 r3            2   .02705237
 r4            3   .04241345
 r5            4   .41910739
 r6            5    .1533913
 r7            6    .2460271
 r8            7   .06639442
 r9            8   .22738701
r10            9   .03444878
r11           10   .15557323
r12           11   .19464246
r13           12   .03145185
r14           13   .13681104
r15           14   .17849533
r16           15   .09946436
r17           16   .02742681
r18           17   .03352088
r19           18   .09933407
r20           19   .00020766
r21           20   .04748425

 9 .
end of do-file

10 . do "C:\Users\user\AppData\Local\Temp\STD27b4_000000.tmp"
```

```
11 . set more off

12 . mat Alpha_FF=(0,9999)

13 . forvalue i=1(1)20 {
     2.  qui reg r`i' rmrf smb hml
     3.  est store ff`i'
     4.  mat beta=e(b)
     5.  sca a_ff`i'=el(beta,1,4)
     6.  mat Alpha_FF=(Alpha_FF \ `i',a_ff`i')
     7. }

14 . est table ff*, star(.1 .05 .01) stat(N rss F r2 r2_a)
```

| Variable | ff1 | ff2 | ff3 | ff4 | ff5 |
|---|---|---|---|---|---|
| rmrf | 88.458388*** | .15618323 | 75.024622*** | 61.286991*** | 82.28291*** |
| smb | -30.483305** | .60757858 | 1.092207 | 53.954532*** | 17.510869 |
| hml | -29.652027** | .01421362 | -16.831267 | 23.318083 | -9.8956295 |
| _cons | -.30036799* | .02917021 | .09651371 | .54137257** | .24517545 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 394.50442 | 17.442327 | 557.60582 | 576.53565 | 333.87253 |
| F | 172.19625 | .17068035 | 105.06507 | 89.562091 | 229.82317 |
| r2 | .81662652 | .00439475 | .73098031 | .69845558 | .85598462 |
| r2_a | .8118841 | -.02135366 | .7240229 | .69065701 | .85226008 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | ff6 | ff7 | ff8 | ff9 | ff10 |
|---|---|---|---|---|---|
| rmrf | 65.828077*** | 99.363511*** | 99.933834*** | 12.587241*** | 88.602574*** |
| smb | 7.0524714 | -4.2836123 | 4.2470385 | -7.7456739 | 28.144644 |
| hml | -3.8808586 | -4.5338083 | .35644319 | -2.8606204 | 4.5713118 |
| _cons | .28268096** | .06469084 | .24142393 | .01544377 | .24200303 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 242.26493 | 347.39698 | 404.13022 | 91.799415 | 1073.6006 |
| F | 178.37712 | 254.1311 | 227.08932 | 13.342101 | 79.645306 |
| r2 | .82184855 | .86794071 | .85450312 | .25653561 | .67318044 |
| r2_a | .81724118 | .86452538 | .85074027 | .23730809 | .66472821 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | ff11 | ff12 | ff13 | ff14 | ff15 |
|---|---|---|---|---|---|
| rmrf | 88.395815*** | 106.51349*** | 95.41369*** | 95.023693*** | 96.70656*** |
| smb | 21.866246 | -16.608141 | -9.3380346 | -6.5211564 | 32.201686 |
| hml | 9.9841502 | -6.3663201 | -10.507753 | -8.0541036 | 26.643361 |
| _cons | .24259989 | -.00860432 | .13495997 | .17933912 | .13446597 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 402.73013 | 282.71843 | 271.3924 | 270.18671 | 1328.344 |
| F | 192.44011 | 339.77687 | 299.90727 | 300.1817 | 67.63698 |
| r2 | .83268917 | .89782712 | .8857955 | .885888 | .63626209 |
| r2_a | .82836216 | .89518472 | .88284194 | .88293682 | .62685507 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | ff16 | ff17 | ff18 | ff19 | ff20 |
|---|---|---|---|---|---|
| rmrf | 91.734718*** | 97.066451*** | 87.040137*** | 84.999799*** | 84.673247*** |
| smb | 13.987945 | 44.444846 | 14.334871 | 12.156005 | 11.773332 |
| hml | -3.5183434 | 25.898477 | -1.7189686 | -9.886029 | -10.417874 |
| _cons | .08765823 | .11427555 | .15543046 | .07292389 | .12042667 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 386.84485 | 1941.3309 | 330.98711 | 441.74976 | 428.36742 |
| F | 221.44127 | 51.113897 | 232.28201 | 174.47532 | 178.84575 |
| r2 | .85134377 | .56932029 | .85729155 | .81858729 | .82223237 |
| r2_a | .84749921 | .55818203 | .85360081 | .81389558 | .81763493 |

legend: * p<.1; ** p<.05; *** p<.01

```
15 . mat list Alpha_FF

Alpha_FF[21,2]
              c1          c2
 r1            0        9999
 r2            1  -.30036799
 r3            2   .02917021
 r4            3   .09651371
 r5            4   .54137257
 r6            5   .24517545
 r7            6   .28268096
 r8            7   .06469084
 r9            8   .24142393
r10            9   .01544377
r11           10   .24200303
r12           11   .24259989
r13           12  -.00860432
r14           13   .13495997
r15           14   .17933912
r16           15   .13446597
r17           16   .08765823
r18           17   .11427555
r19           18   .15543046
r20           19   .07292389
r21           20   .12042667

16 .
end of do-file

17 . do "C:\Users\user\AppData\Local\Temp\STD27b4_000000.tmp"

18 . set more off

19 . mat Alpha_CFF=(0,9999)

20 . forvalue i=1(1)20 {
     2.  qui reg r`i' rmrf smb hml wml
     3.  est store cff`i'
     4.  mat beta=e(b)
     5.  sca a_cff`i'=el(beta,1,5)
     6.  mat Alpha_CFF=(Alpha_CFF \ `i',a_cff`i')
     7. }

21 . est table cff*, star(.1 .05 .01) stat(N rss F r2 r2_a)
```

| Variable | cff1 | cff2 | cff3 | cff4 | cff5 |
|---|---|---|---|---|---|
| rmrf | 88.37442*** | .17216893 | 74.961681*** | 61.414372*** | 82.211925*** |
| smb | -30.555228** | .62127126 | 1.0382938 | 54.063641*** | 17.450066 |
| hml | -29.554175** | -.00441541 | -16.757917 | 23.169639 | -9.8129059 |
| wml | -16.896434 | 3.2167406 | -12.665517 | 25.632471* | -14.28416 |
| _cons | .71766532 | -.16464281 | .85962846 | -1.0030189 | 1.1058157 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 387.65219 | 17.193972 | 553.75558 | 560.76597 | 328.97529 |
| F | 130.8052 | .54401476 | 78.862559 | 69.273695 | 173.85324 |
| r2 | .81981157 | .01857085 | .73283787 | .70670357 | .85809703 |

| | | | | | |
|---|---|---|---|---|---|
| r2_a | .81354415 | -.01556582 | .72354528 | .69650195 | .85316128 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | cff6 | cff7 | cff8 | cff9 | cff10 |
|---|---|---|---|---|---|
| rmrf | 65.851692*** | 99.347739*** | 99.956602*** | 12.61187*** | 88.67622*** |
| smb | 7.0726993 | -4.2971215 | 4.266541 | -7.7245783 | 28.207726 |
| hml | -3.9083788 | -4.5154288 | .32990977 | -2.8893211 | 4.4854877 |
| wml | 4.7520146 | -3.1736513 | 4.5816182 | 4.9558586 | 14.819552 |
| _cons | -.00363444 | .25590768 | -.03462485 | -.2831535 | -.6508953 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 241.72293 | 347.15523 | 403.62639 | 91.20992 | 1068.3294 |
| F | 132.99139 | 189.10684 | 169.0954 | 10.170241 | 59.653079 |
| r2 | .82224711 | .8680326 | .85468451 | .26130981 | .67478508 |
| r2_a | .8160644 | .86344243 | .84963006 | .23561624 | .66347326 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | cff11 | cff12 | cff13 | cff14 | cff15 |
|---|---|---|---|---|---|
| rmrf | 88.493872*** | 106.54016*** | 95.452446*** | 95.059483*** | 96.765085*** |
| smb | 21.950238 | -16.585297 | -9.3048377 | -6.4905003 | 32.251816 |
| hml | 9.8698788 | -6.3973991 | -10.552918 | -8.0958114 | 26.575159 |
| wml | 19.731647 | 5.3665241 | 7.7987449 | 7.2018442 | 11.776732 |
| _cons | -.94625889 | -.33194474 | -.3349251 | -.25458186 | -.57509829 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 393.38536 | 282.02719 | 269.93261 | 268.94182 | 1325.0152 |
| F | 147.16777 | 253.32549 | 224.35281 | 224.36166 | 50.489 |
| r2 | .83657138 | .89807693 | .88640979 | .88641377 | .63717361 |
| r2_a | .8308869 | .89453178 | .88245883 | .88246294 | .62455357 |

legend: * p<.1; ** p<.05; *** p<.01

| Variable | cff16 | cff17 | cff18 | cff19 | cff20 |
|---|---|---|---|---|---|
| rmrf | 91.676764*** | 97.002536*** | 87.064702*** | 84.946218*** | 84.624416*** |
| smb | 13.938304 | 44.390099 | 14.355913 | 12.11011 | 11.731505 |
| hml | -3.4508061 | 25.97296 | -1.7475961 | -9.8235887 | -10.360968 |
| wml | -11.661906 | -12.861352 | 4.943221 | -10.781798 | -9.8261046 |
| _cons | .79030403 | .88918966 | -.14240538 | .72254197 | .71246294 |
| N | 120 | 120 | 120 | 120 | 120 |
| rss | 383.58062 | 1937.3606 | 330.40062 | 438.95963 | 426.05 |
| F | 166.29503 | 38.141745 | 173.06729 | 130.73574 | 133.85767 |
| r2 | .85259814 | .57020108 | .85754442 | .8197331 | .82319408 |
| r2_a | .84747112 | .55525155 | .85258944 | .81346295 | .8170443 |

legend: * p<.1; ** p<.05; *** p<.01

```
22 . mat list Alpha_CFF

Alpha_CFF[21,2]
              c1          c2
 r1            0        9999
 r2            1   .71766532
 r3            2  -.16464281
 r4            3   .85962846
 r5            4  -1.0030189
 r6            5   1.1058157
 r7            6  -.00363444
 r8            7   .25590768
 r9            8  -.03462485
r10            9   -.2831535
r11           10   -.6508953
r12           11  -.94625889
```

```
   r13          12  -.33194474
   r14          13   -.3349251
   r15          14  -.25458186
   r16          15  -.57509829
   r17          16   .79030403
   r18          17   .88918966
   r19          18  -.14240538
   r20          19   .72254197
   r21          20   .71246294

23 .
   end of do-file

24 . reg r1 rmrf smb hml wml

      Source |       SS           df       MS      Number of obs   =       120
-------------+----------------------------------   F(4, 115)       =    130.81
       Model |    1763.719         4   440.92975   Prob > F        =    0.0000
    Residual |  387.652185       115  3.37088857   R-squared       =    0.8198
-------------+----------------------------------   Adj R-squared   =    0.8135
       Total |  2151.37118       119  18.0787494   Root MSE        =     1.836

------------------------------------------------------------------------------
          r1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        rmrf |   88.37442   4.132204    21.39   0.000     80.18932    96.55952
         smb |  -30.55523   15.20777    -2.01   0.047     -60.6789   -.4315607
         hml |  -29.55418   14.55813    -2.03   0.045    -58.39103   -.7173227
         wml |  -16.89643    11.8509    -1.43   0.157    -40.37078    6.57791
       _cons |   .7176653   .7344903     0.98   0.331    -.7372186    2.172549
------------------------------------------------------------------------------

25 . estat dwatson

   Durbin-Watson d-statistic(  5,   120) =  2.349188

26 . vif

    Variable |       VIF       1/VIF
-------------+----------------------
         smb |     11.39    0.087771
         hml |     10.87    0.092012
        rmrf |      1.18    0.851025
         wml |      1.00    0.998808
-------------+----------------------
    Mean VIF |      6.11

27 . log close
      name:  <unnamed>
       log:  C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.2.smcl
  log type:  smcl
 closed on:  26 Jan 2021, 08:37:22
-------------------------------------------------------------------------------

28 .
```

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   16.0   Copyright 1985-2019 StataCorp LLC
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                                      979-696-4601 (fax)

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  Notes:
        1.  Unicode is supported; see help unicode advice.
        2.  More than 2 billion observations are allowed; see help obs advice.
        3.  Maximum number of variables is set to 5000; see help set maxvar.
        4.  New update available; type -update all-

1 . log using "C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.4.smcl"
-------------------------------------------------------------------------------
      name:  <unnamed>
       log:  C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.4.smcl
  log type:  smcl
 opened on:  27 Jan 2021, 15:39:24

2 . use "C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.dta"

3 . reg r1 rmrf smb hml

      Source |       SS           df       MS      Number of obs   =       120
-------------+----------------------------------   F(3, 116)       =    172.20
       Model |  1756.86676         3  585.622255   Prob > F        =    0.0000
    Residual |  394.504419       116  3.40090016   R-squared       =    0.8166
-------------+----------------------------------   Adj R-squared   =    0.8119
       Total |  2151.37118       119  18.0787494   Root MSE        =    1.8442

------------------------------------------------------------------------------
          r1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        rmrf |   88.45839   4.150136    21.31   0.000     80.23852    96.67826
         smb |  -30.48331   15.27524    -2.00   0.048    -60.73783   -.2287763
         hml |  -29.65203   14.62263    -2.03   0.045    -58.61399   -.6900658
       _cons |   -.300368   .1729078    -1.74   0.085    -.6428337    .0420977
------------------------------------------------------------------------------

4 . estat dwatson

  Durbin-Watson d-statistic(  4,   120) =  2.342202

5 . corr r1 rmrf smb hml
  (obs=120)

             |       r1     rmrf      smb      hml
-------------+------------------------------------
          r1 |   1.0000
        rmrf |   0.9000   1.0000
         smb |   0.3065   0.3499   1.0000
         hml |  -0.2709  -0.2829  -0.9514   1.0000
```

```
6 . reg r1 rmrf
```

| Source | SS | df | MS | Number of obs | = | 120 |
|---|---|---|---|---|---|---|
| | | | | F(1, 118) | = | 503.20 |
| Model | 1742.7065 | 1 | 1742.7065 | Prob > F | = | 0.0000 |
| Residual | 408.664685 | 118 | 3.46326004 | R-squared | = | 0.8100 |
| | | | | Adj R-squared | = | 0.8084 |
| Total | 2151.37118 | 119 | 18.0787494 | Root MSE | = | 1.861 |

| r1 | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| rmrf | 86.67481 | 3.863877 | 22.43 | 0.000 | 79.02328 | 94.32634 |
| _cons | -.2804526 | .1734399 | -1.62 | 0.109 | -.6239108 | .0630056 |

```
7 . crr r1 rmrf
command crr is unrecognized
r(199);

8 . corr r1 rmrf
(obs=120)
```

| | r1 | rmrf |
|---|---|---|
| r1 | 1.0000 | |
| rmrf | 0.9000 | 1.0000 |

```
9 . log close
      name:  <unnamed>
       log:  C:\Users\user\Documents\BE TU\BE Classwork\Year2\EE426\assign1.4.smcl
  log type:  smcl
 closed on:  27 Jan 2021, 15:43:14

10 .
```