```
                                                   ___  ___  ___  ___  ___(R)
                                                  /_   /   /__/ /   /__/
                                                 __/  /   /__/  /   /__/
                                                  Statistics/Data analysis

                                                     User: AAPL Final Output
                                                  Project: Econometrics Project


   ___  ___  ___  ___  ___ ®
  /_   /   /__/ /   /__/         18.0
 __/  /   /__/  /   /__/         BE—Basic Edition

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   Notes:
         1. Unicode is supported; see help unicode advice.
         2. New update available; type -update all-
```

1 . do "C:\Users\gprooney\AppData\Local\Temp\STD4970_000000.tmp"

2 . clear all

3 . cd "C:\Users\gprooney\Downloads"
  C:\Users\gprooney\Downloads

4 . import excel "AAPL_reg_data.xlsx", firstrow
  (7 vars, 231 obs)

5 .
6 . describe

  Contains data
   Observations: 231
      Variables: 7

Variable name	Storage type	Display format	Value label	Variable label
date	int	%td..		date
ret_past	double	%4.2f		ret_past
ret_est	double	%4.2f		ret_est
ret_act	double	%4.2f		ret_act
log_mktcap	double	%10.0g		log_mktcap
vix	double	%10.0g		vix
log_pe	double	%10.0g		log_pe

  Sorted by:
       Note: Dataset has changed since last saved.

7 . gen mdate = mofd(date)

8 . format mdate %tm

```
 9 .
10 . // Hypotheses for Coefficients
11 . // ret_est: negative
12 . // ret_past: positive
13 . // log_mktcap: negative
14 . // vix: positive
15 . // log_pe: negative
16 .
17 . tsset mdate

   Time variable: mdate, 2005m1 to 2024m3
           Delta: 1 month

18 .
19 . //EYEBALL STATIONARY
20 . //twoway line ret_act date // looks stationary, realistically will decrease over time
21 . //twoway line ret_est date // looks stationary, realistically will decrease over time
22 . //twoway line ret_past date // looks stationary, realistically will decrease over time
23 . //twoway line log_mktcap date // trending up
24 . //twoway line vix date // looks stationary
25 . //twoway line log_pe date // looks like it drifts a little
26 .
27 . // STATIONARY: for variables
28 . dfuller ret_act        // no trend

   Dickey-Fuller test for unit root          Number of obs  = 230
   Variable: ret_act                         Number of lags =   0

   H0: Random walk without drift, d = 0
```

	Test statistic	Dickey–Fuller critical value		
		1%	5%	10%
Z(t)	-4.623	-3.467	-2.881	-2.571

MacKinnon approximate *p*-value for Z(t) = 0.0001.

```
29 . dfuller ret_est        // no trend

   Dickey-Fuller test for unit root          Number of obs  = 230
   Variable: ret_est                         Number of lags =   0

   H0: Random walk without drift, d = 0
```

	Test statistic	Dickey–Fuller critical value		
		1%	5%	10%
Z(t)	-6.292	-3.467	-2.881	-2.571

MacKinnon approximate *p*-value for Z(t) = 0.0000.

```
30 . dfuller ret_past        // no trend

   Dickey-Fuller test for unit root          Number of obs  = 230
   Variable: ret_past                        Number of lags =   0

   H0: Random walk without drift, d = 0
```

	Test statistic	Dickey–Fuller critical value		
		1%	5%	10%
Z(t)	-3.743	-3.467	-2.881	-2.571

MacKinnon approximate *p*-value for Z(t) = **0.0036**.

31 . dfuller log_mktcap, trend // very clear trending

Dickey–Fuller test for unit root   Number of obs   = **230**
Variable: **log_mktcap**   Number of lags =   **0**

H0: Random walk with or without drift

	Test statistic	Dickey–Fuller critical value		
		1%	5%	10%
Z(t)	-3.118	-3.997	-3.433	-3.133

MacKinnon approximate *p*-value for Z(t) = **0.1019**.

32 . dfuller vix   // no trend, but closer at 0.0244

Dickey–Fuller test for unit root   Number of obs   = **230**
Variable: **vix**   Number of lags =   **0**

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value		
		1%	5%	10%
Z(t)	-3.130	-3.467	-2.881	-2.571

MacKinnon approximate *p*-value for Z(t) = **0.0244**.

33 . dfuller log_pe, drift   // there is a no trend with p-value after accounting for drift

Dickey–Fuller test for unit root   Number of obs   = **230**
Variable: **log_pe**   Number of lags =   **0**

H0: Random walk with drift, d = 0

	Test statistic	t-distribution critical value		
		1%	5%	10%
Z(t)	-2.597	-2.343	-1.652	-1.285

p-value for Z(t) = **0.0050**

34 .
35 . // REGRESSION

36 . reg ret_act ret_est ret_past log_mktcap vix log_pe

Source	SS	df	MS			
Model	9.73227651	5	1.9464553	Number of obs	=	231
Residual	28.2123529	225	.125388235	F(5, 225)	=	15.52
				Prob > F	=	0.0000
				R-squared	=	0.2565
				Adj R-squared	=	0.2400
Total	37.9446294	230	.16497665	Root MSE	=	.3541

ret_act	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
ret_est	-.5012058	.2112853	-2.37	0.019	-.9175569	-.0848548
ret_past	-.2623431	.0705482	-3.72	0.000	-.4013627	-.1233235
log_mktcap	-.1478041	.0247855	-5.96	0.000	-.1966455	-.0989627
vix	.0079259	.0026171	3.03	0.003	.0027688	.013083
log_pe	-.0522486	.0790176	-0.66	0.509	-.2079579	.1034607
_cons	2.393279	.4054623	5.90	0.000	1.59429	3.192268

37 . predict e_ols, resid

38 .
39 . // FUNCTIONAL FORM: Ramsey
40 . estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of **ret_act**

H0: Model has no omitted variables

F(**3, 222**) = **5.10**
 Prob > F = **0.0020**

41 .
42 . // MULTICOLLINEARITY
43 . estat vif

Variable	VIF	1/VIF
ret_past	**2.27**	**0.441120**
log_pe	**2.00**	**0.499365**
log_mktcap	**1.75**	**0.570600**
ret_est	**1.72**	**0.582117**
vix	**1.67**	**0.597465**
Mean VIF	**1.88**	

44 .
45 . // SERIAL CORRELATION
46 . ac e_ols // 6 lags are outside the confidence band

47 . pac e_ols // significant at 8 lags (so staying at the 12 lag as well)

48 . // Breusch-Godfrey LM

49 . estat bgodfrey, lags(1/6)

Breusch–Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	162.311	1	0.0000
2	164.173	2	0.0000
3	164.443	3	0.0000
4	164.910	4	0.0000
5	166.084	5	0.0000
6	166.087	6	0.0000

H0: no serial correlation

50 . estat bgodfrey, lags(1/12)

Breusch–Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	162.311	1	0.0000
2	164.173	2	0.0000
3	164.443	3	0.0000
4	164.910	4	0.0000
5	166.084	5	0.0000
6	166.087	6	0.0000
7	166.153	7	0.0000
8	168.122	8	0.0000
9	168.226	9	0.0000
10	168.595	10	0.0000
11	168.595	11	0.0000
12	168.623	12	0.0000

H0: no serial correlation

51 .
52 . // —-- Heteroskedasticity —--- //
53 . // Testing For Residual Normality
54 . sktest e_ols // _____

Skewness and kurtosis tests for normality

Variable	Obs	Pr(skewness)	Pr(kurtosis)	Adj chi2(2)	Prob>chi2
				——— Joint test ———	
e_ols	231	0.7168	0.2294	1.59	0.4515

55 .
56 . // Breusch-Pagan Test
57 . estat hettest, rhs

Breusch–Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variables: All independent variables

H0: Constant variance

    chi2(5) = 33.70
Prob > chi2 = 0.0000

```
58 .
59 . // White Test
60 . estat imtest, white

    White's test
    H0: Homoskedasticity
    Ha: Unrestricted heteroskedasticity

       chi2(20) =  88.55
    Prob > chi2 = 0.0000

    Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	88.55	20	0.0000
Skewness	11.00	5	0.0513
Kurtosis	1.75	1	0.1861
Total	101.30	26	0.0000

```
61 .
62 . // NEWEY (assume a lag of 6, will change depending on AIC & pac results)
63 . newey ret_act ret_est ret_past log_mktcap vix log_pe, lag(12)

    Regression with Newey-West standard errors      Number of obs    =      231
    Maximum lag = 12                                 F(  5,     225) =     8.42
                                                     Prob > F        =   0.0000
```

ret_act	Coefficient	Newey-West std. err.	t	P>|t|	[95% conf. interval]	
ret_est	-.5012058	.3429359	-1.46	0.145	-1.176983	.1745711
ret_past	-.2623431	.1489538	-1.76	0.080	-.5558661	.0311798
log_mktcap	-.1478041	.0443675	-3.33	0.001	-.2352331	-.060375
vix	.0079259	.0048853	1.62	0.106	-.0017008	.0175526
log_pe	-.0522486	.2117961	-0.25	0.805	-.4696063	.3651091
_cons	2.393279	.6354467	3.77	0.000	1.141091	3.645467

```
64 . newey ret_act ret_est ret_past log_mktcap vix log_pe, lag(6)

    Regression with Newey-West standard errors      Number of obs    =      231
    Maximum lag = 6                                  F(  5,     225) =     7.81
                                                     Prob > F        =   0.0000
```

ret_act	Coefficient	Newey-West std. err.	t	P>|t|	[95% conf. interval]	
ret_est	-.5012058	.3350966	-1.50	0.136	-1.161535	.1591232
ret_past	-.2623431	.141727	-1.85	0.065	-.5416252	.0169389
log_mktcap	-.1478041	.0426351	-3.47	0.001	-.2318193	-.0637889
vix	.0079259	.0043904	1.81	0.072	-.0007257	.0165775
log_pe	-.0522486	.1817053	-0.29	0.774	-.4103104	.3058132
_cons	2.393279	.5812409	4.12	0.000	1.247907	3.538651

```
65 .
66 .
67 .
68 .
69 .
70 .
71 . // ------------------------------------------------------------------
72 . // EXTRA STUFF
73 . // ------------------------------------------------------------------
74 .
75 . // AIC & BIC test
76 . //reg ret_act ret_est ret_past log_mktcap vix log_pe
77 . //estat ic
78 . //reg ret_act L(1/6).ret_act ret_est ret_past log_mktcap vix log_pe
79 . //estat ic
80 . //reg ret_act  L(1/12).ret_act ret_est ret_past log_mktcap vix log_pe
81 . //estat ic
82 .
83 .
84 . // COINTEGRATION TEST (Is NOT required)
85 . //reg ret_act ret_est ret_past log_mktcap vix log_pe
86 . //predict e_ols, resid
87 . //dfuller e_ols, nocons
88 .
   end of do-file

89 .
```