

```

--
name: <unnamed>
log: /Users/mien/Desktop/ee426/6104640328_assignment14.log
log type: text
opened on: 4 May 2021, 00:13:44

```

```

. tsset time
time variable: time, 1 to 795
delta: 1 unit

```

```

. dfuller spot, trend lag(1) regress

```

Augmented Dickey-Fuller test for unit root Number of obs = 793

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-1.339	-3.960	-3.410	-3.120

MacKinnon approximate p-value for Z(t) = 0.8780

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0042396	.0031666	-1.34	0.181	-.0104556	.0019764
LD.	.0832853	.035481	2.35	0.019	.013637	.1529337
_trend	-.000739	.0014208	-0.52	0.603	-.0035281	.00205
_cons	2.253569	1.884627	1.20	0.232	-1.445907	5.953046

```

. dfuller spot, lag(1) regress

```

Augmented Dickey-Fuller test for unit root Number of obs = 793

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-1.238	-3.430	-2.860	-2.570

MacKinnon approximate p-value for Z(t) = 0.6570

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0034926	.002821	-1.24	0.216	-.0090301	.0020448
LD.	.0828543	.035455	2.34	0.020	.0132572	.1524514
_cons	1.597051	1.39888	1.14	0.254	-1.14891	4.343012

```

. dfuller spot, nocon lag(1) regress

```

Augmented Dickey-Fuller test for unit root Number of obs = 793

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-0.585	-2.580	-1.950	-1.620

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0003419	.0005845	-0.58	0.559	-.0014892	.0008054
LD.	.0811979	.0354321	2.29	0.022	.011646	.1507499

```
. dfuller future, trend lag(1) regress
```

```
Augmented Dickey-Fuller test for unit root          Number of obs   =          793
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-1.374	-3.960	-3.410	-3.120

```
Mackinnon approximate p-value for Z(t) = 0.8685
```

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0050243	.0036579	-1.37	0.170	-.0122046	.002156
LD.	-.0335608	.0355846	-0.94	0.346	-.1034125	.036291
_trend	-.0009128	.0016705	-0.55	0.585	-.0041919	.0023663
_cons	2.67398	2.183399	1.22	0.221	-1.611978	6.959937

```
. dfuller future, lag(1) regress
```

```
Augmented Dickey-Fuller test for unit root          Number of obs   =          793
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-1.264	-3.430	-2.860	-2.570

```
Mackinnon approximate p-value for Z(t) = 0.6453
```

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0041054	.0032469	-1.26	0.206	-.0104789	.0022682
LD.	-.0340903	.0355556	-0.96	0.338	-.103885	.0357044
_cons	1.866323	1.606292	1.16	0.246	-1.286783	5.019429

```
. dfuller future, nocon lag(1) regress
```

```
Augmented Dickey-Fuller test for unit root          Number of obs   =          793
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-0.609	-2.580	-1.950	-1.620

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0004181	.0006863	-0.61	0.543	-.0017653	.0009291
LD.	-.0360006	.0355254	-1.01	0.311	-.1057359	.0337347

```
. *spot and future are nonstationary
```

```
. g rspot=(spot/l.spot)-1  
(1 missing value generated)
```

```
. g rfuture=(future/l.future)-1  
(1 missing value generated)
```

```
. dfuller rsopt, trend lag(1) regress
variable rsopt not found
r(111);
```

```
. dfuller rspot, trend lag(1) regress
```

```
Augmented Dickey-Fuller test for unit root          Number of obs   =          792
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-17.710	-3.960	-3.410	-3.120

```
Mackinnon approximate p-value for Z(t) = 0.0000
```

D.rspot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
rspot						
L1.	-.8597466	.048545	-17.71	0.000	-.9550394	-.7644539
LD.	-.0798976	.0355137	-2.25	0.025	-.1496103	-.0101849
_trend	1.03e-06	2.89e-06	0.36	0.721	-4.64e-06	6.71e-06
_cons	-.0004573	.0013254	-0.35	0.730	-.0030591	.0021445

```
. dfuller rfuture, trend lag(1) regress
```

```
Augmented Dickey-Fuller test for unit root          Number of obs   =          792
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-19.613	-3.960	-3.410	-3.120

```
Mackinnon approximate p-value for Z(t) = 0.0000
```

D.rfuture	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
rfuture						
L1.	-1.008595	.0514258	-19.61	0.000	-1.109543	-.9076473
LD.	-.0327739	.0356244	-0.92	0.358	-.1027038	.037156
_trend	1.36e-06	3.42e-06	0.40	0.690	-5.35e-06	8.07e-06
_cons	-.000539	.0015671	-0.34	0.731	-.0036152	.0025373

```
. *rspot and rfuture are stationary
```

```
. g y = spot
```

```
. do "/var/folders/gd/lj8knfw94978yk_mkbspsmvr0000gn/T//SD01137.000000"
```

```
. forvalue d = 1(1)1 {
2.     forvalue p = 1(1)4 {
3.         forvalue q = 1(1)4 {
4.             display "estimate arima`p``d``q'"
5.             capture: quietly arch y, arima(`p',`d',`q') nolog
6.             if _rc~=0 {
7.                 display "flatlog when pdq =" `p``d``q'
8.                 continue
9.             }
10.            estimates store arima`p``d``q'
11.            display "arima`p``d``q' already estimated"
12.        }
13.    }
14. estimates table arima1`d'1 arima1`d'2 arima1`d'3 arima1`d'4, star(0.1 0.05
0.01)
> stat(aic bic ll)
```

```

15. estimates table arima2`d'1 arima2`d'2 arima2`d'3 arima2`d'4, star(0.1 0.05
0.01)
> stat(aic bic ll)
16. estimates table arima3`d'1 arima3`d'2 arima3`d'3 arima3`d'4, star(0.1 0.05
0.01)
> stat(aic bic ll)
17. estimates table arima4`d'1 arima4`d'2 arima4`d'3 arima4`d'4, star(0.1 0.05
0.01)
> stat(aic bic ll)
18. }
estimate arima111
arima111 already estimated
estimate arima112
arima112 already estimated
estimate arima113
arima113 already estimated
estimate arima114
arima114 already estimated
estimate arima211
arima211 already estimated
estimate arima212
arima212 already estimated
estimate arima213
arima213 already estimated
estimate arima214
arima214 already estimated
estimate arima311
arima311 already estimated
estimate arima312
arima312 already estimated
estimate arima313
arima313 already estimated
estimate arima314
arima314 already estimated
estimate arima411
arima411 already estimated
estimate arima412
arima412 already estimated
estimate arima413
arima413 already estimated
estimate arima414
arima414 already estimated

```

Variable		arima111	arima112	arima113	arima114
y	_cons	-.10463992	-.10431285	-.10490685	-.10762587
ARMA					
	ar				
	L1.	.43560284*	.32893676	-.20984574	.59516858
	ma				
	L1.	-.35365432	-.25292378	.28723483	-.52234499
	L2.		.02671647	.06246922	-.00145314
	L3.			.0707883*	.03367041
	L4.				-.07222272*
SIGMA2					
	_cons	66.263079***	66.237621***	66.074703***	65.939507***
Statistics					
	aic	5590.984	5592.6813	5592.7471	5593.1444
	bic	5609.6924	5616.0667	5620.8096	5625.884
	ll	-2791.492	-2791.3407	-2790.3735	-2789.5722

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

Variable	arima211	arima212	arima213	arima214
----------	----------	----------	----------	----------

y	_cons	-.10439333	-.10728779	-.10617421	-.10500045
ARMA					
	ar				
	L1.	.30245493	1.3262749***	.46573674***	1.3083584***
	L2.	.02458526	-.92606037***	-.83932653***	-.94941919***
	ma				
	L1.	-.22523074	-1.3037166***	-.39263666***	-1.2435323***
	L2.		.94997828***	.83198047***	.90762974***
	L3.			.09625687***	.0510337
	L4.				.01103757
SIGMA2					
	_cons	66.242605***	65.241971***	65.854335***	65.065435***
Statistics					
	aic	5592.7574	5582.6829	5592.1328	5584.5362
	bic	5616.1428	5610.7454	5624.8724	5621.9528
	ll	-2791.3787	-2785.3414	-2789.0664	-2784.2681

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

Variable	arima311	arima312	arima313	arima314	
y					
	_cons	-.1048968	-.10616092	-.10736138	-.10716531
ARMA					
	ar				
	L1.	-.56022313	.56905277***	.66921804**	.58399606
	L2.	.08578916*	-.9024755***	-.07185295	.02605952
	L3.	.06384012**	.09786885***	-.59940023*	-.6759125
	ma				
	L1.	.63830067	-.49240481***	-.61205348*	-.51833092
	L2.		.89237576***	.05741574	-.03475758
	L3.			.6591812**	.72229767
	L4.				.02392784
SIGMA2					
	_cons	66.099007***	65.826877***	65.060223***	65.039841***
Statistics					
	aic	5593.0503	5591.795	5584.4358	5586.1767
	bic	5621.1128	5624.5346	5621.8525	5628.2704
	ll	-2790.5251	-2788.8975	-2784.2179	-2784.0883

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

Variable	arima411	arima412	arima413	arima414	
y					
	_cons	-.10700174	-.10496533	-.10675534	-.104999
ARMA					
	ar				
	L1.	.60248722*	1.3757144***	.61609697	3.0809908***
	L2.	-.0019893	-1.0295639***	.00752267	-4.2436261***
	L3.	.023634	.05267008	-.68004034	2.9453463***
	L4.	-.07473907**	.00827206	.02406626	-.92112409***
	ma				
	L1.	-.5260961	-1.3105503***	-.54961384	-3.0682946***
	L2.		.98439637***	-.01812688	4.2422896***
	L3.			.72581698	-2.9736652***
	L4.				.94238613***

SIGMA2				
_cons	65.901721***	65.064862***	65.037662***	64.460257***
Statistics				
aic	5592.6351	5584.5083	5586.1528	5581.1168
bic	5625.3746	5621.9249	5628.2466	5627.8877
ll	-2789.3175	-2784.2541	-2784.0764	-2780.5584

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

```

.
end of do-file

. drop y

. g y = future

. do "/var/folders/gd/lj8knfw94978yk_mksbpmvr0000gn/T//SD01137.000000"

. forvalue d = 1(1)1 {
2.     forvalue p = 1(1)4 {
3.         forvalue q = 1(1)4 {
4.             display "estimate arima`p`d`q'"
5.             capture: quietly arch y, arima(`p',`d',`q') nolog
6.             if _rc~=0 {
7.                 display "flatlog when pdq =" `p`d`q'
8.                 continue
9.             }
10.            estimates store arima`p`d`q'
11.            display "arima`p`d`q' already estimated"
12.        }
13.    }
14. estimates table arima1`d`1 arima1`d`2 arima1`d`3 arima1`d`4, star(0.1 0.05
0.01)
> stat(aic bic ll)
15. estimates table arima2`d`1 arima2`d`2 arima2`d`3 arima2`d`4, star(0.1 0.05
0.01)
> stat(aic bic ll)
16. estimates table arima3`d`1 arima3`d`2 arima3`d`3 arima3`d`4, star(0.1 0.05
0.01)
> stat(aic bic ll)
17. estimates table arima4`d`1 arima4`d`2 arima4`d`3 arima4`d`4, star(0.1 0.05
0.01)
> stat(aic bic ll)
18. }
estimate arima111
arima111 already estimated
estimate arima112
arima112 already estimated
estimate arima113
arima113 already estimated
estimate arima114
arima114 already estimated
estimate arima211
arima211 already estimated
estimate arima212
arima212 already estimated
estimate arima213
arima213 already estimated
estimate arima214
arima214 already estimated
estimate arima311
arima311 already estimated
estimate arima312
arima312 already estimated
estimate arima313
arima313 already estimated
estimate arima314
arima314 already estimated
estimate arima411

```

arima411 already estimated
 estimate arima412
 arima412 already estimated
 estimate arima413
 arima413 already estimated
 estimate arima414
 arima414 already estimated

Variable	arima111	arima112	arima113	arima114
y				
_cons	-.11432563	-.11400352	-.11366935	-.11347922
ARMA				
ar				
L1.	-.36816035	.30272882	.07436802	-.26456486
ma				
L1.	.3308072	-.3394337	-.11092545	.23073323
L2.		.04466896	.03456419	.02954671
L3.			.03331469	.04087236
L4.				.03859252
SIGMA2				
_cons	91.05804***	90.997716***	90.933526***	90.860749***
Statistics				
aic	5843.4462	5844.8434	5846.3248	5847.7426
bic	5862.1545	5868.2288	5874.3873	5880.4822
ll	-2917.7231	-2917.4217	-2917.1624	-2916.8713

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

Variable	arima211	arima212	arima213	arima214
y				
_cons	-.11379223	-.11508157	-.11482625	-.11462985
ARMA				
ar				
L1.	.26005669	.42869661***	.39696294***	.29639265***
L2.	.03927821	-.84726867***	-.83605438***	-.89677302***
ma				
L1.	-.29534278	-.48248824***	-.43732186***	-.33461008***
L2.		.89316606***	.86966618***	.94830452***
L3.			.02148423	-.00001662
L4.				.05206546*
SIGMA2				
_cons	91.012739***	89.91852***	89.890915***	89.740656***
Statistics				
aic	5844.9761	5837.4031	5839.1186	5839.8602
bic	5868.3615	5865.4656	5871.8582	5877.2768
ll	-2917.488	-2912.7016	-2912.5593	-2911.9301

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

Variable	arima311	arima312	arima313	arima314
y				
_cons	-.11384426	-.11458734	-.11492239	-.11476326
ARMA				
ar				
L1.	.06451079	1.2452522***	.6453398	.02424427
L2.	.02925675	-.83596928***	-.94249565**	-.78181194***

L3.	.02303968	-.05609096**	.2285926	-.24804315
ma				
L1.	-.10040305	-1.2923957***	-.68231737	-.06283572
L2.		.9477119***	.98531858*	.82344015***
L3.			-.21171533	.25739791
L4.				.05512145*

SIGMA2				
_cons	90.977418***	89.27889***	89.869608***	89.725336***

Statistics				
aic	5846.6791	5833.7382	5840.9748	5841.7255
bic	5874.7416	5866.4778	5878.3914	5883.8192
ll	-2917.3396	-2909.8691	-2912.4874	-2911.8627

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

Variable	arima411	arima412	arima413	arima414
y				
_cons	-.11370251	-.11502509	-.11467468	-.09433643

ARMA				
ar				
L1.	-.26104119	.3161496***	.08746028	-.51431187***
L2.	.01701857	-.85360612***	-.75575117***	.16550014***
L3.	.03131005	.00070305	-.21064566	-.50560807***
L4.	.03094164	.04860909*	.05142281*	-.90096666***
ma				
L1.	.22471541	-.35553447***	-.12655014	.4492091***
L2.		.90413286***	.79836538***	-.15354146***
L3.			.21954605	.55977968***
L4.				.91986116***

SIGMA2				
_cons	90.917794***	89.759506***	89.735401***	87.730629***

Statistics				
aic	5848.1785	5839.9931	5841.8236	5825.8456
bic	5880.918	5877.4098	5883.9173	5872.6164
ll	-2917.0892	-2911.9966	-2911.9118	-2902.9228

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

.
end of do-file

. *The most appropriated order for rspot is ARIMA(1,1,1)

. *for rfuture is ARIMA(1,1,1)

. log close

name: <unnamed>

log: /Users/mien/Desktop/ee426/6104640328_assignment14.log

log type: text

closed on: 4 May 2021, 00:34:30

```

--
name: <unnamed>
log: /Users/mien/Desktop/ee426/14.log
log type: text
opened on: 4 May 2021, 00:36:29

```

```
. arima spot, arima(1,1,1) nolog
```

ARIMA regression

```

Sample: 2 - 795          Number of obs   =      794
Log likelihood = -2791.496      Wald chi2(2)   =      18.31
                                Prob > chi2     =      0.0001

```

D.spot	Coef.	OPG Std. Err.	z	P> z	[95% Conf. Interval]	
spot						
_cons	-.1047174	.3525647	-0.30	0.766	-.7957316	.5862967
ARMA						
ar						
L1.	.4353655	.2343856	1.86	0.063	-.0240219	.8947528
ma						
L1.	-.3535108	.242659	-1.46	0.145	-.8291138	.1220922
/sigma	8.139999	.1507405	54.00	0.000	7.844553	8.435444

Note: The test of the variance against zero is one sided, and the two-sided confidence interval is truncated at zero.

```
. set obs 800
number of observations (_N) was 795, now 800
```

```
. replace time=_n
(5 real changes made)
```

```
. predict yhat, y dynamic(.) t0(795)
Note: beginning dynamic predictions in period      4.
(794 missing values generated)
```

```
. twoway (line spot time, sort) (scatter yhat time, sort)
```

```
. arima future, arima(1,1,1) nolog
```

ARIMA regression

```

Sample: 2 - 795          Number of obs   =      794
Log likelihood = -2917.724      Wald chi2(2)   =      3.33
                                Prob > chi2     =      0.1890

```

D.future	Coef.	OPG Std. Err.	z	P> z	[95% Conf. Interval]	
future						
_cons	-.1142458	.3326737	-0.34	0.731	-.7662743	.5377828
ARMA						
ar						
L1.	-.368505	.5847749	-0.63	0.529	-1.514643	.7776328
ma						
L1.	.3311954	.5949511	0.56	0.578	-.8348873	1.497278
/sigma	9.54277	.1687756	56.54	0.000	9.211975	9.873564

Note: The test of the variance against zero is one sided, and the two-sided

confidence interval is truncated at zero.

```
. predict yhat2, y dynamic(.) t0(795)
Note: beginning dynamic predictions in period      4.
(794 missing values generated)
```

```
. twoway (line future time, sort) (scatter yhat2 time, sort)
```

```
. reg rfuture rspot
```

Source	SS	df	MS	Number of obs	=	794
Model	.338771077	1	.338771077	F(1, 792)	=	6189.46
Residual	.043348982	792	.000054734	Prob > F	=	0.0000
				R-squared	=	0.8866
				Adj R-squared	=	0.8864
Total	.382120059	793	.000481866	Root MSE	=	.0074

rfuture	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
rspot	1.108778	.0140935	78.67	0.000	1.081113 1.136443
_cons	.0000525	.0002626	0.20	0.841	-.0004629 .0005679

```
. graph save Graph "/Users/mien/Desktop/ee426/future.gph"
(file /Users/mien/Desktop/ee426/future.gph saved)
```

```
. graphsave Graph "/Users/mien/Desktop/ee426/future.gph", replace
(file /Users/mien/Desktop/ee426/future.gph saved)
```

```
. *there is ARCH effect since p-value<0.05
```

```
. qui arch rfuture rspot, garch(1/1) arch(1/1) nolog
```

```
. qui estat ic
```

```
. qui mat ic=r(s)
```

```
. qui scalar sic0=el(ic,1,6)
```

```
. local opt_lag_p=1
```

```
. local pot_lag_q=1
```

```
. do "/var/folders/gd/lj8knfw94978yk_mkbspsmvr0000gn/T//SD01137.000000"
```

```
. forvalue p = 1(1)2 {
2.     forvalue q = 1(1)2 {
3.         display "estimate garch`p``q'"
4.         capture: quietly arch rfuture rspot, garch(1/`p') arch(1/`q')
```

```
no
```

```
> log
```

```
5.         if _rc~=0 {
6.             display "flatlog when pdq =" `p``q'
7.             continue
8.         }
9.         qui estimates store garch`p``d``q'
10.        qui estat ic
11.        qui mat ic=r(s)
12.        qui scalar sic1=el(ic,1,6)
13.        if sic1<sic0 {
14.            local pot_lag_p=`p'
15.            local opt_lag_q=`q'
16.        }
17.        display "garch`p``q' already estimated"
18.    }
19. }
```

```
estimate garch11
```

```
garch11 already estimated
```

```
estimate garch12
```

```
garch12 already estimated
```

```

estimate garch21
garch21 already estimated
estimate garch22
garch22 already estimated

.
.
end of do-file

. estimates table garch11 garch12 garch21 garch22, star(0.1 0.05 0.05) stat(aic bic
l
> l)
invalid numlist has too few elements
invalid specification of star()
r(198);

. display "optimal order for GARCH = "`opt_lag_p`'`opt_lag_q'"
optimal order for GARCH = 1

. arch rfuture rspot, garch(1/`opt_lag_p`) arch(1/`opt_lag_q`) nolog
arch() invalid -- invalid numlist
r(121);

. do "/var/folders/gd/lj8knfw94978yk_mksbpmvr0000gn/T//SD01137.000000"

. forvalue p=1(1)2 {
2.     forvalue q=1(1)2 {
3.         display "estimate garch`p`q'"
4.         capture: qui arch rfuture rspot, garch(1/`p`) arch(1/`q`)
nolog
5.             if _rc~=0 {
6.                 display "flatlog when pq = "`p`q'"
7.                 continue
8.             }
9.         qui estimates store garch`p`q'
10.        qui estat ic
11.        qui mat ic=r(S)
12.        qui scalar sic1=el(ic,1,6)
13.        if sic1<sic0 {
14.            local opt_lag_p=`p'
15.            local opt_lag_q=`q'
16.        }
17.        display "garch`p`q' already estimated"
18.    }
19.    }
estimate garch11
garch11 already estimated
estimate garch12
garch12 already estimated
estimate garch21
garch21 already estimated
estimate garch22
garch22 already estimated

.
.
end of do-file

. estimates table garch11 garch12 garch21 garch22, star(0.1 0.05 0.01) stat(aic bic
ll)

```

Variable	garch11	garch12	garch21	garch22
rfuture				
rspot	1.066779***	1.0686232***	1.0662306***	1.0681952***
_cons	.00003063	.00002254	.00002879	.00002246
ARCH				
arch				
L1.	.08462311***	.21216544***	.11369073***	.21614028***
L2.		-.14954533***		-.17303687***

garch					
L1.		.89700599***	.92239371***	.54514854	1.1227156***
L2.				.31487299	-.17547446
_cons		9.850e-07***	7.744e-07***	1.380e-06**	5.016e-07**

Statistics					
aic		-5702.2841	-5708.9307	-5702.54	-5707.938
bic		-5678.8987	-5680.8682	-5674.4775	-5675.1984
ll		2856.1421	2860.4654	2857.27	2860.969

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

```
. display "Optimal order for GARCH = "`opt_lag_p'\`opt_lag_q'
Optimal order for GARCH = 1
```

```
. display "Optimal order for GARCH = "`opt_lag_p'\`opt_lag_q'
Optimal order for GARCH = 1
```

```
. Optimal order for GARCH = 12
command Optimal is unrecognized
r(199);
```

```
. display "Optimal order for GARCH = "`opt_lag_p'\`opt_lag_q'
Optimal order for GARCH = 1
```

```
. arch rfuture rspot, garch(1/\`opt_lag_p') arch(1/\`opt_lag_q') nolog
arch() invalid -- invalid numlist
r(121);
```

```
. predict sigmahat, v
```

```
. line sigmahat time
```

```
. graph save Graph "/Users/mien/Desktop/ee426/14_07.gph"
(file /Users/mien/Desktop/ee426/14_07.gph saved)
```

```
. twoway (line spot time, sort) (scatter yhat time, sort)
```

```
. graph save Graph "/Users/mien/Desktop/ee426/spot.gph"
(file /Users/mien/Desktop/ee426/spot.gph saved)
```





