

Assignment 7

1)

`. reg rfuture rspot if t>1`

| Source | SS | df | MS | Number of obs | = | 7,683 |
|----------|------------|-------|------------|---------------|---|---------|
| Model | .01531231 | 1 | .01531231 | F(1, 7681) | = | 6787.70 |
| Residual | .017327485 | 7,681 | 2.2559e-06 | Prob > F | = | 0.0000 |
| | | | | R-squared | = | 0.4691 |
| | | | | Adj R-squared | = | 0.4691 |
| Total | .032639795 | 7,682 | 4.2489e-06 | Root MSE | = | .0015 |

| rfuture | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] | |
|---------|----------|-----------|-------|-------|----------------------|----------|
| rspot | .7889924 | .0095766 | 82.39 | 0.000 | .7702196 | .8077651 |
| _cons | 7.58e-06 | .0000171 | 0.44 | 0.658 | -.000026 | .0000412 |

`. estat archlm`

LM test for autoregressive conditional heteroskedasticity (ARCH)

| lags(p) | chi2 | df | Prob > chi2 |
|---------|-------|----|-------------|
| 1 | 6.951 | 1 | 0.0084 |

H0: no ARCH effects vs. H1: ARCH(p) disturbance

ANS. Since the p-value of the ARCH effect test is 0.0084 greater than the level of significance 0.05 (>0.05), Fail to reject the null hypothesis that no ARCH effects, thus, there no exists significant ARCH effect in this model with 0.05 significant level.

2)

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

ARCH family regression

```
Sample: 2 - 7684                Number of obs =      7,683
Distribution: Gaussian           Wald chi2(1) =    144307.52
Log likelihood = 39695.02       Prob > chi2      =      0.0000
```

| rfuture | OPG | | z | P> z | [95% Conf. Interval] | |
|----------------|----------|-----------|--------|-------|----------------------|----------|
| | Coef. | Std. Err. | | | | |
| rfuture | | | | | | |
| rspot | .8163565 | .002149 | 379.88 | 0.000 | .8121445 | .8205684 |
| _cons | 9.03e-06 | .0000117 | 0.77 | 0.442 | -.000014 | .000032 |
| ARCH | | | | | | |
| arch | | | | | | |
| L1. | .1583881 | .0035412 | 44.73 | 0.000 | .1514473 | .1653288 |
| garch | | | | | | |
| L1. | .7734091 | .0038485 | 200.96 | 0.000 | .7658662 | .7809521 |
| _cons | 1.95e-07 | 5.80e-09 | 33.59 | 0.000 | 1.84e-07 | 2.06e-07 |

```
. est store garch11
```

```
. arch rfuture rspot, arch(1) garch(1/2) nolog
```

ARCH family regression

```
Sample: 2 - 7684                Number of obs =      7,683
Distribution: Gaussian           Wald chi2(1) =    118872.72
Log likelihood = 39697.75       Prob > chi2      =      0.0000
```

| rfuture | OPG | | z | P> z | [95% Conf. Interval] | |
|----------------|----------|-----------|--------|-------|----------------------|----------|
| | Coef. | Std. Err. | | | | |
| rfuture | | | | | | |
| rspot | .8153024 | .0023647 | 344.78 | 0.000 | .8106677 | .8199372 |
| _cons | 8.43e-06 | .0000118 | 0.71 | 0.476 | -.0000148 | .0000316 |
| ARCH | | | | | | |
| arch | | | | | | |
| L1. | .1729301 | .0061173 | 28.27 | 0.000 | .1609404 | .1849198 |
| garch | | | | | | |
| L1. | .6135755 | .0310702 | 19.75 | 0.000 | .5526791 | .674472 |
| L2. | .1402245 | .0250327 | 5.60 | 0.000 | .0911613 | .1892877 |
| _cons | 2.09e-07 | 8.64e-09 | 24.17 | 0.000 | 1.92e-07 | 2.26e-07 |

```
. est store garch21
```

```
. arch rfuture rspot, arch(1/2) garch(1) nolog
flat log likelihood encountered, cannot find uphill direction
r(430);

. arch rfuture rspot, arch(1/2) garch(1/2) nolog
flat log likelihood encountered, cannot find uphill direction
r(430);
. est table garch*, star(0.1 0.05 0.01) stat(N ll chi2 aic bic)
```

| Variable | garch11 | garch21 |
|-------------------|--------------|--------------|
| rfuture | | |
| rspot | .81635648*** | .81530244*** |
| _cons | 9.029e-06 | 8.434e-06 |
| ARCH | | |
| arch | | |
| L1. | .15838806*** | .17293011*** |
| garch | | |
| L1. | .77340915*** | .61357553*** |
| L2. | | .14022448*** |
| _cons | 1.949e-07*** | 2.089e-07*** |
| Statistics | | |
| N | 7683 | 7683 |
| ll | 39695.018 | 39697.749 |
| chi2 | 144307.52 | 118872.72 |
| aic | -79380.035 | -79383.498 |
| bic | -79345.302 | -79341.818 |

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

Choose the model with the lowest BIC which is GARCH(1,1)

3)

```
. predict rfutoref, y
(1 missing value generated)

. twoway (line rfutoref t) (scatter rfuture t)

. predict sigma2, variance

. line sigma2 t
```

