

Assignment 7

1. Test whether there exists significant ARCH effects.

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

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

```
. reg rfuture rspot
```

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

```
. est store ols
```

```
. 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

As the p-value of the ARCH effect test is less than 0.05, the null hypothesis is rejected. Therefore, **ARCH effect exists** in this model.

2. Estimate GARCH(p, q) for spot return (rspot) using future return (rfuture) as explanatory variable for mean equation – determine the most appropriated order p and q for variance equation using SBIC given the maximum lag equals to 2.

```

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

. est store garch11

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

. est store garch12

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

. est store garch21

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

. est store garch22

. est table garch*, star(0.1 0.05 0.01) stat(N ll chi2 aic bic)

```

Variable	garch11	garch12	garch21	garch22
rfuture				
rspot	.81635286***	.81530126***		.82409491***
_cons	9.029e-06	8.433e-06		9.847e-06
ARCH				
arch				
L1.	.15839025***	.17293404***		.13296433***
L2.				.13457681***
garch				
L1.	.7734087***	.61357911***		-.18056271***
L2.		.14021461***		.81010016***
_cons	1.949e-07***	2.089e-07***		2.942e-07***

__000003				
L1.			.62083787***	
L2.			.01945821*	
__000004				
L1.			-.61385787***	
_cons			8.055e-07***	
Statistics				
N	7683	7683	7651	7683
ll	39695.018	39697.749	75820.156	39717.257
chi2	144308.34	118873.81		110222.84
aic	-79380.035	-79383.498	-151632.31	-79420.514
bic	-79345.302	-79341.818	-151604.54	-79371.886

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

The most appropriated order p and q is **GARCH (2,2)** as it has the lowest value at -79371.886.

3. From (2), predict the variance of future return (rfuture).

