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Assignment 5

Due: 20/11/2018

The following GARCH model:

Mean Equation: $$rfuture_t = \alpha + \beta rspot_t + \varepsilon_t \quad (1)$$

Variance Equation: $$\sigma_t^2 = \alpha_0 + \sum_{j=1}^{p} \delta_j \sigma_{t-j}^2 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 \quad (2)$$

From the data set assign04.dta:

Requirements:

1. Test whether there exists significant ARCH effects.
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.
3. From (2), predict the variance of future return (*rfuture*).

1

```
. reg rfuture rspot
```

Source	SS	df	MS	Number of obs	=	7,683
				F(1, 7681)	=	6787.70
Model	.01531231	1	.01531231	Prob > F	=	0.0000
Residual	.017327485	7,681	2.2559e-06	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

< 0.05

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

$\therefore H_0$ is rejected which means ARCH effect exists

2.

Firstly, identify order (p,q) using SIC

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

. est store garch11

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

. est store garch21

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

. est store garch12

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

. est store garch22

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

Variable	garch11	garch21	garch12	garch22
rfuture				
rspot	.8163588***	.81530327***		
_cons	9.035e-06	8.434e-06		
ARCH				
arch				
L1.	.15839275***	.1729364***		
garch				
L1.	.77340651***	.61354908***		
L2.		.1402425***		
_cons	1.949e-07***	2.089e-07***		
_				
__000003				
L1.			.62083787***	.68844496***
L2.			.01945821*	-.08678925
__000004				
L1.			-.61385787***	-.68147208***
L2.				.10808718
_cons			8.035e-07***	8.922e-07***
Statistics				
N	7683	7683	7651	7650
ll	39695.018	39697.749	75820.156	75810.682
chi2	144307.98	118871.71		
aic	-79380.035	-79383.498	-151632.31	-151611.36
bic	-79345.302	-79341.818	-151604.54	-151576.65

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

Lowest

cannot use GARCH model when (p,q) = (1,2) and (2,2)

∴ The most appropriated order (p,q) is (1,1)

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

ARCH family regression

Sample: 2 - 7684                                Number of obs   =      7,683
Distribution: Gaussian                          Wald chi2(1)    =  144307.98
Log likelihood =  39695.02                      Prob > chi2     =     0.0000
```

rfuture	Coef.	OPG Std. Err.	z	P>|z|	[95% Conf.	Interval]
rfuture						
rspot	.8163588	.002149	379.88	0.000	.8121468	.8205708
_cons	9.03e-06	.0000117	0.77	0.441	-.000014	.000032
ARCH						
arch						
L1.	.1583928	.0035413	44.73	0.000	.1514519	.1653336
garch						
L1.	.7734065	.0038485	200.96	0.000	.7658637	.7809494
_cons	1.95e-07	5.80e-09	33.59	0.000	1.84e-07	2.06e-07

3.

```
. predict sigma2, variance

. line sigma2 t
```