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1. **Test whether there exists significant ARCH effects**

```
. qui reg rfuture rspot if t>1
. 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
```

In this case, since p-value of the ARCH effect test (F-statistic or Chi-Square (Obs*Rsquared = 6.951) the p-value is less than level of significance 0.05, thus, null hypothesis that there is no ARCH effect is rejected, thus, there exists significant ARCH effect in this model with 0.05 significant level.

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**

```
. est table garch*, star(0.1 0.05 0.01) stat(N ll chi2 aic bic)
----------------------------------------------
    Variable |    garch11          garch21
-------------+--------------------------------
rfuture      |
       rspot |  .81635662***    .81530526***
       _cons |  9.030e-06       8.434e-06
-------------+--------------------------------
ARCH         |
        arch |
         L1. |    .158392***      .1729232***
             |
       garch |
         L1. |  .77340359***    .61359169***
         L2. |                  .14021906***
             |
       _cons |  1.949e-07***    2.088e-07***
-------------+--------------------------------
Statistics   |
           N |       7683             7683
          ll |  39695.018        39697.749
        chi2 |  144307.39        118874.79
         aic | -79380.035       -79383.498
         bic | -79345.302       -79341.818
----------------------------------------------
           legend: * p<.1; ** p<.05; *** p<.01
```

The GARCH(1,1) has the lowest BiC(-79345.302), therefore it is the most appropriate one.

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

```
. predict sigma2, variance
. line sigma2 t
```