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Graduate School of Business
 Business 41202, Spring Quarter 2007, Mr. Ruey S. Tsay

Solutions to Homework Assignment #5

R (and part of S-Plus) output is in a separate file. I do not include any plot in the solution.

1. There is a 2-for-1 stock split at $t = 1137$. You can use the program “ohlc” to perform the calculation. Take the square-root transformation before calculating the summary statistics.

Variable	Mean	Median	Maximum	Minimum
s_0	0.824	0.640	10.02	0.00
s_1	1.065	0.843	7.096	0.00
s_2	0.862	0.781	2.763	0.270
s_3	1.527	1.387	4.985	0.473
s_5	0.863	0.799	2.919	0.268
s_6	1.577	1.449	5.279	0.483

2. For s_{yz} the mean, median, maximum, and minimum are 0.018, 0.018, 0.032, and 0.00, respectively.
3. The mean of squared forecast errors is 0.0012, which is close to the sample variance 0.0012 of the returns in the forecasting subsample.
4. I used 0.55 as a threshold to classify the direction of forecast. This results in a hit of 21 out of 36, which is about 58%.
5. I used the percentage returns. For the GJR model, the AR parameters in the mean equation are not significant so that the selected model is

$$R_t = 1.20 + a_t, \quad a_t = \sigma_t \epsilon_t, \quad \epsilon_t \sim t_{9,70}.$$

$$\sigma_t^2 = 2.32 + (0.074 + 0.067N_{t-1})a_{t-1}^2 + 0.852\sigma_{t-1}^2.$$

The leverage parameter has a p-value of 0.081 so that it is significant at the 10% level, but not at the 5% level.

For the EGARCH model, after estimating several models, I selected the simple one for the simple return series (not in percentages). The fitted model is

$$R_t = 0.012 + a_t, \quad a_t = \sigma_t \epsilon_t, \quad \epsilon_t \sim N(0, 1).$$

$$\ln(\sigma_t^2) = -5.29 + \frac{1 + 2.01B}{1 - 0.94B}g(\epsilon_t), \quad g(\epsilon_t) = -0.014\epsilon_t + 0.094[|\epsilon_t| - 0.8].$$

The p-value of the leverage parameter is 0.33 and the estimate 2.01 of the ARCH parameter is also insignificant.

In comparison, the leverage effect as shown in the GJR model seems larger than that of the EGARCH model. Note that this might be due to estimation problem of the Ox formulation. If one use the EGARCH(1,1) model in S-Plus, the fitted model is

$$R_t = 0.013 + a_t, \quad a_t = \sigma_t \epsilon_t, \quad \epsilon_t \sim N(0, 1).$$

$$\ln(\sigma_t^2) = -0.31 + 0.20 \frac{|a_{t-1}| - 0.16a_{t-1}}{\sigma_{t-1}} + 0.97 \ln(\sigma_{t-1}^2).$$

Here the leverage parameter has a p-value of 0.049.