

THE UNIVERSITY OF CHICAGO
Graduate School of Business
Business 41202, Spring Quarter 2007, Mr. Ruey S. Tsay

Homework Assignment #5

Due Date: Campus – May 18; Weekend – May 19, 2007.

1. The file “d-catohlc0107.txt” contains daily open, high, low, closing prices and other variables for the stock of Caterpillar Inc. from January 2001 to May 7, 2007. The names of the variables are given in the file (i.e. header). The data are downloaded from Yahoo Finance. Use the data to construct the variance estimates $\sigma_{i,t}^2$ of Section 3.15.2 of the textbook for $i = 0, 1, 2, 3, 5,$ and 6. Take the square root transformation to obtain volatility series. Obtain mean, median, maximum, and minimum of each of the six volatility series.

Remark: The file has 1593 rows and 9 columns. Yahoo puts the most recent observations first. To reverse the order, you may do the following in R (or S-Plus).

```
da=read.table('d-catohlc0107.txt', header=T)
cat=da
for (i in 1:1593){
  ii=1593-i+1
  cat[ii,]=da[i,]
}
```

2. Again, consider the data in “d-catohlc0107.txt”. Use the data and $n = 63$ to compute the Yang and Zhang (2000) variance estimate $\hat{\sigma}_{yz}^2$ of Section 3.15.2 of the textbook. Obtain a time plot of the estimated volatility series (square-root of variance). Also, obtain the mean, median, maximum, and minimum of the volatility series.
3. Consider the monthly simple return of GE stock from 1926 to 2006. Divide the data into estimation and forecasting subsamples with the former consisting of observations from 1926 to 2003. Use r_{t-1}, r_{t-2} and r_{t-3} as input to build a 3-3-1 neural network to forecast the monthly simple returns in the forecasting subsample. Calculate the mean of squared forecast errors. Compare it with the sample variance of the returns in the forecasting subsample.
4. Again, consider the monthly simple returns of GE stock of Question 3. However, suppose we are interested in the direction of the price movement of the stock. Use the same input to build a 3-3-1 neural network to predict the price movement in the

forecasting subsample. Calculate the percentage of hits (here a hit denotes a correct prediction for the direction).

In R and S-Plus, you may use the command

$$\text{drtn} = \text{ifelse}(\text{rtn} > 0, 1, 0)$$

to create a direction series for the return rtn .

5. Again, consider the monthly simple returns of the GE stock in Question 3. (a) Build a proper GJR model for the series. (b) Build an EGARCH model for the series. Compare the estimated leverage effects of the two models.

Reading assignments: Chapters 3 and 4 of the textbook.