

THE UNIVERSITY OF CHICAGO
Graduate School of Business
Business 41202, Spring Quarter 2006, Mr. Ruey S. Tsay

Homework Assignment #4

Note:

1. **Due Date:** Campus – May 5; Evening – May 4, 2006.
 2. All tests use the 5% significance level for type-I error.
 3. Use ten (10) lags in all ACF or ARCH-effect tests.
 4. The purpose of this assignment is to analyze the volatility series for returns of daily stock and index, and monthly stock and index.
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1. The file “d-bavw9605.txt” contains the daily simple returns of Boeing stock (BA) and CRSP value-weighted index (VW) from 1996 to 2005. The file has three columns containing date, BA return, VW return. The returns include dividends. Convert the simple returns into log returns.
 - Is there any serial correlation in the log returns of BA stock?
 - Is there any ARCH effect in the BA stock log returns?
 - Specify a GARCH model for the BA log return using Gaussian distribution for the innovations. Perform model checking and write down the fitted model.
 - Find an adequate GARCH model for the log series but using the Student-t distribution for the innovations. Write down the fitted model.
 2. Consider the daily log returns of VW index in Problem 1.
 - Is there any serial correlation in the log returns of VW index?
 - Is there any ARCH effect in the log return series of VW index?
 - Build an adequate GARCH model for the log return series of the index using Student-t distribution for the innovations.
 - Compute 1- to 4-step ahead forecasts for the daily log return and its volatility based on the fitted model.
 3. Again, consider the daily log returns of BA stock in Problem 1.

- Find an adequate GARCH-M model for the series with Student-t distribution. Write down the fitted model.
 - Find an adequate EGARCH model for the series. Is the “leverage” effect significant at the 5% level?
4. Consider the monthly simple returns of Alcoa (AA) stock and the S&P 500 index (SP) from 1960 to 2005. The data are in the file “m-aasp6005.txt” with format (date, AA return, SP return) and the sample size is 552. Transform the simple returns into log returns.
- Is there any serial correlation in the monthly log returns of AA stock?
 - Is there any ARCH effect in the monthly log returns of AA stock?
 - Fit a GARCH(1,1) model to the monthly log returns of AA stock using generalized error distribution for the innovations. Write down the fitted model.
 - Calculate 1-step to 5-step ahead forecasts based on the fitted GARCH(1,1) model.
5. Consider the monthly log returns of S&P 500 index from 1960 to 2005 shown in Problem 4.
- Is there any serial correlation in the series?
 - Is there any ARCH effect in the series?
 - Fit a GJR(1,1) model to the SP log return series with generalized error distribution and write down the fitted model.
 - Is the leverage effect significant at the 5% level? If not, is it significant at the 10% level?

Reading assignments: Chapter 3 of the textbook.