

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

Homework Assignment #4

Note:

1. **Due Date:** Campus – May 4; Weekend – May 5, 2007.
 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 and monthly asset returns.
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1. The file “d-sbuxsp0106.txt” contains the daily simple returns of Starbucks stock (SBUX) and the S&P 500 compisite index from 1996 to 2006. The file consists of date, SBUX return, and S&P returns in three columns. The returns include dividends. Convert the simple returns into **percentage** log returns.
 - Is there any serial correlation in the log returns of Starbucks stock?
 - Is there any ARCH effect in the log returns of Starbucks stock?
 - Fit a GARCH(1,1) model for the percentage log return of Starbucks stock using Gaussian distribution for the innovations. Perform model checking and write down the fitted model.
 - Fit the GARCH(1,1) model again using the Student-t distribution for the innovations. Write down the fitted model.
 2. Consider the daily percentage log returns of S&P 500 index in Problem 1.
 - Is there any serial correlation in the log returns of S&P index?
 - Is there any ARCH effect in the log return series of S&P index?
 - Fit an IGARCH(1,1) 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 percentage log return and its volatility based on the fitted model.
 3. Again, consider the daily percentage log returns of Starbucks stock in Problem 1.

- Fit a GARCH(1,1)-M model for the series with Student-t distribution. Write down the fitted model.
 - Is the ARCH-in-mean parameter significant at the 5% level?
 - Fit a GJR(1,1) model with Gaussian innovations to the log return series. Perform model checking and write down the fitted model.
 - Is the “leverage” parameter significant?
4. The data file “m-pg5606.txt” contains the date and monthly simple returns of Procter & Gamble (PG) stock from 1956 to 2006. Transform the simple returns into percentage log returns.
- Is there any serial correlation in the monthly log returns of PG stock?
 - Fit a GARCH(1,1) model to the monthly percentage log returns of PG stock using generalized error distribution for the innovations. Write down the fitted model.
 - Use the fitted model to calculate 1-step to 5-step ahead forecasts for the log returns series and its volatility.
5. The file “d-exuseu.txt” contains the daily exchange rate between U.S. Dollars and Euro from January 1999 to March 20, 2007. Compute the percentage log returns of the exchange rate.
- Is there any serial correlation in the log return series?
 - Is there any ARCH effect in the log return series?
 - Fit an IGARCH(1,1) model to the log return series using Gaussian innovations. Perform model checking and write down the fitted model. [Note: This is the model used in RiskMetrics to compute VaR.]
 - Use the model to produce 1-step to 4-step ahead forecasts for the log return series and its volatility.

Reading assignments: Chapter 3 of the textbook.