Homework 4

To answer questions in this homework, (a) use 5% significance level in tests, and (b) use 10 lags of serial correlations for return series.

1. Consider the daily returns of the exchange trade fund (ETF) SPDR S&P 500 of State Street Global Advisors from September 4, 2001, to September 30, 2011. The tick symbol is `SPY` and there are 2535 observations. The simple returns are and in the file `hwdata1.txt`. Transform the simple returns to log returns.
   (a) Is the expected log return zero? Are there any serial correlations in the log returns? Is there ARCH effect in the log returns?
   (b) Fit a Gaussian ARMA–GARCH model for the log return series. Perform model checking, obtain the QQ plot of the standardized residuals, and write down the fitted model. [Hint: Try GARCH(2,1).]
   (c) Build an ARMA–GARCH model with Student t innovations for the log return series. Perform model checking and write down the fitted model.
2. Consider the monthly stock returns of the Coca-Cola Company (KO) from January 1961 to September 2011. The simple returns are n the file `hwdata2.txt`. Transform the simple returns to log returns.
   (a) Is the expected monthly log return zero? Is there any serial correlation in the log returns? Is there any ARCH effect in the log returns?
   (b) Build a Gaussian GARCH model for the log returns. Perform model checking and write down the fitted model.
   (c) Build a GARCH model with Student t innovations for the log returns. Perform model checking, obtain the QQ plot of the standardized residuals, and write down the fitted model. Also, obtain 1- to 5-step ahead volatility predictions.
3. Consider the monthly log returns of KO stock. Multiple the log returns by 100. That is, use percentage log returns.
   (a) Fit a TGARCH model to the series. Perform model checking and write down the fitted model. Is the level effect different from zero?
   (b) Fit an GJRGARCH model to the series. Perform model checking and write down the fitted model.
4. Consider the daily stock returns of Procter & Gamble from September 1, 2001, to September 30, 2011. The simple returns are in the file `hwdata3.txt`. Transform the simple returns to log returns.
   (a) Is there any serial correlation in the log returns?
   (b) Fit an ARMA model to the log returns to remove serial correlations. Write down the fitted model.
   (c) Let r_t be the residuals of the ARMA model and $x_t = 100 \times r_t$. Is there ARCH effect in x_t?
   (d) Fit an EGARCH model to x_t. Perform model checking and write down the fitted model.