R exercises: week 1

Financial Econometrics

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CHAPTER 1: Introduction

1. Run the following R files, inspect the code carefully, and make the following changes:

   (a) `Load_Yahoo_Data.R`

   - change the stock ticker from IBM to UPS;
   - change the frequency from daily to monthly;
   - change the starting date to the 10th of January 1999;
   - plot returns (1st difference of prices) instead of log-returns (1st difference of log-prices).

   (b) `ACF_plot.R`

   - change the stock ticker from IBM to AAPL;
   - plot the ACF and PACF for squared returns.

2. Use R to answer the following questions:

   - Plot the daily prices and respective log-returns of the NASDAQ stock index (^IXIC) and Dow Jones stock index (^DJI) over the past 15 years.
   - Plot the monthly prices and respective log-returns of the NASDAQ index and Dow Jones index over the past 15 years.
   - Plot the squared daily log-returns of NASDAQ and Dow Jones over the past 15 years.
   - Plot the squared monthly log-returns of NASDAQ and Dow Jones over the past 15 years.
   - Do you find evidence of autocorrelation in the daily log-returns of NASDAQ and Dow Jones over the last 15 years? Report the ACF.
   - Do you find evidence of autocorrelation in the monthly log-returns of NASDAQ and Dow Jones over the last 15 years? Report the ACF.
   - Do you find evidence of autocorrelation in the daily squared log-returns of NASDAQ and Dow Jones over the last 15 years? Report the ACF.
   - Do you find evidence of autocorrelation in the monthly squared log-returns of NASDAQ and Dow Jones over the last 15 years? Report the ACF.

CHAPTER 2 and 3: ARCH and GARCH models

1. Run the R file `Simulate_GARCH.R` and make the following changes:
   - Set the starting value of the recursion of σ_t^2 equal to 1.3, i.e. $\sigma_1^2 = 1.3$;
   - Set the parameter values to $(\omega, \alpha_1, \beta_1) = (0.3, 0.15, 0.80)$;
   - Simulate a time series of length 2000;
   - Plot the generated log-returns and the corresponding ACF and PACF;
   - Plot the squared log-returns and corresponding ACF and PACF;
2. Write R code to simulate from an ARCH(1) model. Use the code to do the following:
   - Generate from an ARCH(1) model with parameters $(\omega, \alpha_1) = (0.3, 0.5)$ a time series of length $T = 3000$;
   - Plot the ACF and PACF of the squared log-returns of the generated series;
   - How may lags of the ACF and PACF are significant? Is this coherent with the theory? Comment on the results;
3. Write R code to simulate from an ARCH(2) model. Use the code to do the following:
   - Generate from an ARCH(2) model with parameters $(\omega, \alpha_1, \alpha_2) = (0.3, 0.5, 0.3)$ a time series of length $T = 3000$;
   - Plot the ACF and PACF of the squared log-returns of the generated series;
   - How may lags of the ACF and PACF are significant? Is this coherent with the theory? Comment on the results;