Time Series Analysis

Introduction to EViews

1. Import to EViews the file "DOWJONES.xls" (download from homepage) which contains daily close values of the Dow Jones index.

2. Compute continuously compounded returns $r_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$ (log returns) for the Dow Jones Index and square the computed return series. Note that $r_t \approx \left(\frac{P_t - P_{t-1}}{P_{t-1}}\right)$ and that by computing log returns one assumes continuous compounding of the invested capital between $t-1$ and t, i.e. $P_t = \exp(r_t)P_{t-1}$. Log returns are more suitable from a statistical perspective than simple returns $R_t = \frac{P_t}{P_{t-1}}$ as one can compute multi-period returns $r_t(q) = \ln\left(\frac{P_t}{P_{t-q}}\right)$ by adding the single period log returns, whilst for computing multiperiod simple returns $R_t^q = \frac{P_t}{P_{t-q}}$ from single-period returns one has to **multiply** the single period returns. From mathematical statistics more results are available regarding the sum of a sequence of random variables (e.g. laws of large numbers and central limit theorems) than for multiplicative sequences of random variables.

3. Plot the three time series (Dows Jones, log returns, and squared log returns) and provide meaningful axis labels and titles. Export the graphics in your word processor (Word or LaTeX).

4. Compute a histogram of the empirical return distribution and export the resulting figure into your word processor (Word or LaTeX). Use meaningful axis labels and titles for the figure.

5. Compute sample mean, sample variance and sample kurtosis for the sample of log returns. Compute the 0.01 and the 0.05 empirical quantile of the sample distribution of the log returns. Interpret these results.

6. Compute sample autocorrelations for the log return and squared log return series. Use a graphical representation of the sample ACF (Abscissae: Lag (j); Ordinate: $\hat{\rho}_j$). Export the figure into your word processor using meaningful axis labels and titles for the figure. Interpret your results with respect to the predictability of asset returns and squared asset returns.

7. Conduct a unit root test to check if the P_t series is stationary (choose an appropriate Dickey/Fuller specification). Interpret the test result.

8. Compute the first differences of the $\ln(P_t)$ series, i.e. r_t. Conduct a unit root test to check if the r_t series is stationary (choose an appropriate Dickey/Fuller specification).