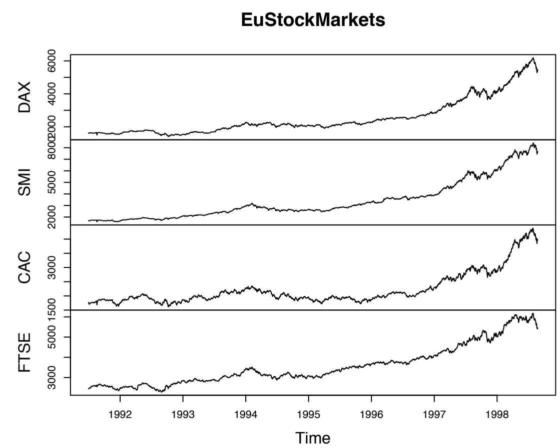
Problem P1: Chapter 4 R-lab

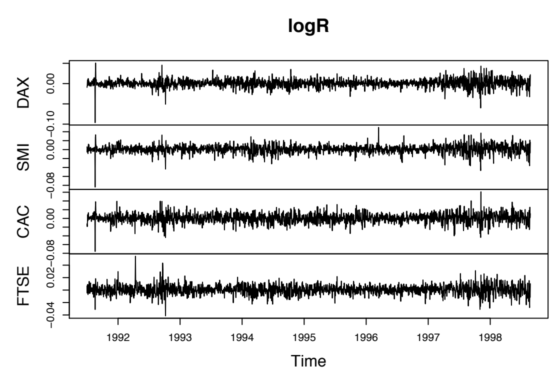
Problem 1

The four times series are not stationary, and they tend to increase in the long run. The fluctuations are not of constant size. It seems the volatility fluctuations are much larger in the years 1997 to 1998.



Problem 2

The series look stationary, while the fluctuations seem to be bounded in magnitude, and there are times that the fluctuations tend to diverge from the mean significantly.



Problem 3

The four normal plots are symmetric but with heavier tails than normal. For Shapiro-Wilk tests, a p-value <= 0.05 would reject the null hypothesis that the samples come from normal distribution. All the four series have p-values much smaller than 0.05 from the Shapiro-Wilk test, therefore, they are not sampled from populations that follow normal distribution.

Shapiro-Wilk normality test of DAX

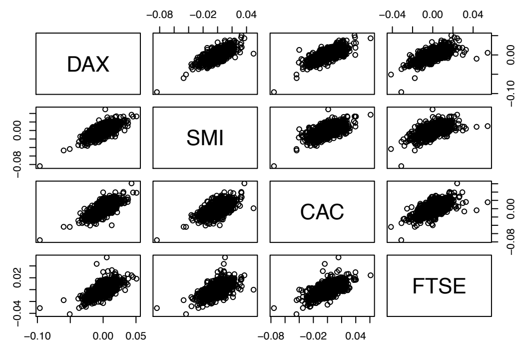
data: logR[, 1]

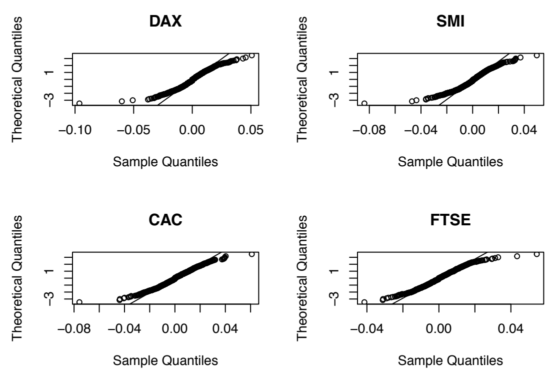
W = 0.95384, p-value < 2.2e-16

Shapiro-Wilk normality test of SMI
data: logR[, 2]
W = 0.95537, p-value < 2.2e-16

Shapiro-Wilk normality test of CAC
data: logR[, 3]
W = 0.98203, p-value = 1.574e-14

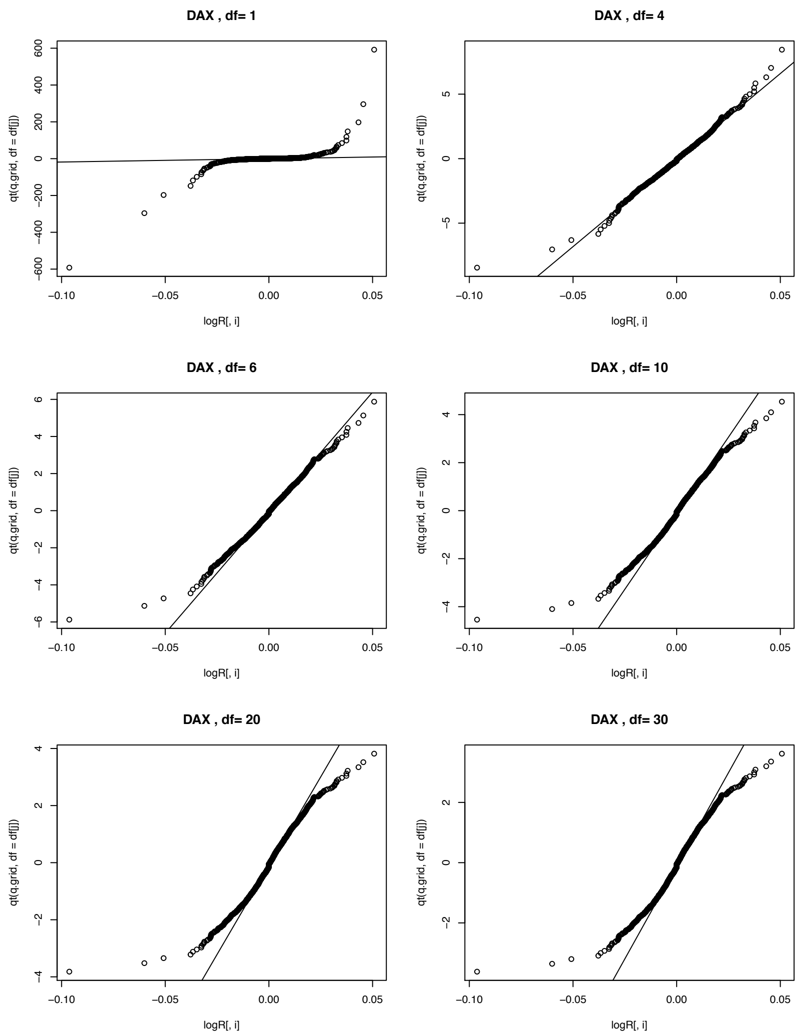
Shapiro-Wilk normality test of FTSE
data: logR[, 4]
W = 0.97994, p-value = 1.754e-15





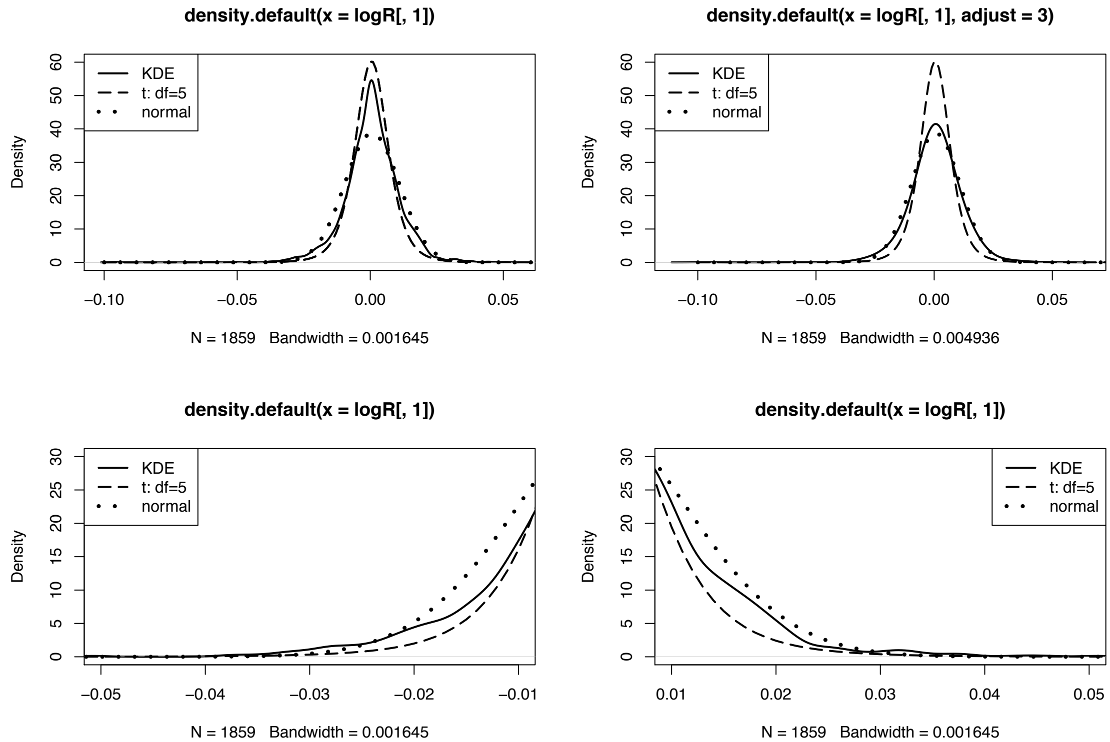
Problem 4
(1) “q.grid = (1:n)/(n+1)” creates a series 1/(n+1), 2/(n+1), …, n/(n+1).
(2) “qt(q.grid, df = df[j])” calculates the percentile of the student t-distribution based on the series of q.grid with j degrees of freedom, and qt is the quantile function of the student t-distribution.
(3) “paste” converts its input into strings.

Only plots for DAX is shown here.



Problem 5
Degree of freedom of 4-6 gives the best-fitting t-distribution, as the plots almost align with the reference lines.

Problem 6
The student t-distribution seems to have a better fit, as the normal distribution has a much lower peak.



Problem 7

The default bandwidth selector is nrd0, and the default kernel is Gaussian.