

Introduction to Financial Risk Management (with R)

Exercise 10 – Estimate parameters of the scaled student-t distribution

Overview

The goal of this exercise is to use R to test if daily log returns are normally distributed.

Estimate parameters of the scaled student-t distribution of the daily log returns of the Wilshire 5000 index

In the lectures, we ran the following R script to create a data series called “wilsh”:

```
library(quantmod)
getSymbols("WILL5000IND",src="FRED")
wilsh <- na.omit(WILL5000IND)
wilsh <- wilsh["1979-12-31/2017-12-31"]
names(wilsh) <- "TR"
```

Next, we calculated its daily log returns:

```
logret <- diff(log(wilsh))[-1]
```

In the lectures, we used the “moments” package in R to estimate the parameters of the scaled student-t distribution:

```
library(MASS)
rvec <- as.vector(logret)
t.fit <- fitdistr(rvec, “t”)
round(t.fit$estimate,6)
```

Using the estimated parameters, we estimated the VaR and ES at the 95% confidence level:

```
alpha <- 0.05
set.seed(123789)
library(metRology)
rvec <- rt.scaled(100000,mean=t.fit$estimate[1],sd=t.fit$estimate[2],df=t.fit$estimate[3])
VaR <- quantile(rvec,alpha)
ES <- mean(rvec[rvec<VaR])
round(VaR,6)
round(ES,6)
```

Estimate parameters of the scaled student-t distribution of the daily log returns of Gold

In Exercise 2, you retrieved the price of gold in the London Bullion Market at 3pm from FRED: “GOLDPMGBD228NLBM”

You calculated its daily log returns from 1979-12-31 to 2017-12-31.

In this exercise, you will estimate the parameters of the scaled student-t distribution. Then you will estimate the VaR and ES at the 95% confidence level.