Figure 1 in Elamir and Seheult (2004)

Alberto Viglione

First of all load the library:

```
> library(nsRFA)
```

and generate the samples from the Normal distribution:

```
> Nsim=1000
> n=60

> campsimulati <- rnorm(n*Nsim)

> campsimulati <- matrix(campsimulati, ncol=n)
```

Then calculate l_3 and $SE(l_3)$:

```
> lmom <- t(apply(campsimulati, 1, Lmoments))
> vlmom <- t(apply(campsimulati, 1, varLmoments, matrix=FALSE))
> l3 <- lmom[,"lca"]*lmom[,"l2"]
> sl3 <- sqrt(vlmom[,"var.l3"])

> l3gaussian <- l3/sl3
```

and plot the results:

```
> qqnorm(l3gaussian, main="Normal Q-Q Plot for Gaussian samples")
>  qqline(l3gaussian)
```

Repeat the same procedure for the Student distribution:

```
> campsimulati <- rt(n*Nsim, df=5)

> campsimulati <- matrix(campsimulati, ncol=n)
> lmom <- t(apply(campsimulati, 1, Lmoments))
> vlmom <- t(apply(campsimulati, 1, varLmoments, matrix=FALSE))
> l3 <- lmom[,"lca"]*lmom[,"l2"]
> sl3 <- sqrt(vlmom[,"var.l3"])

> l3student <- l3/sl3
```

the Cauchy distribution:

```
> campsimulati <- rcauchy(n*Nsim)

> campsimulati <- matrix(campsimulati, ncol=n)
> lmom <- t(apply(campsimulati, 1, Lmoments))
> vlmom <- t(apply(campsimulati, 1, varLmoments, matrix=FALSE))
> l3 <- lmom[,"lca"]*lmom[,"l2"]
> sl3 <- sqrt(vlmom[,"var.l3"])

> l3cauchy <- l3/sl3
```

and the Uniform distribution:

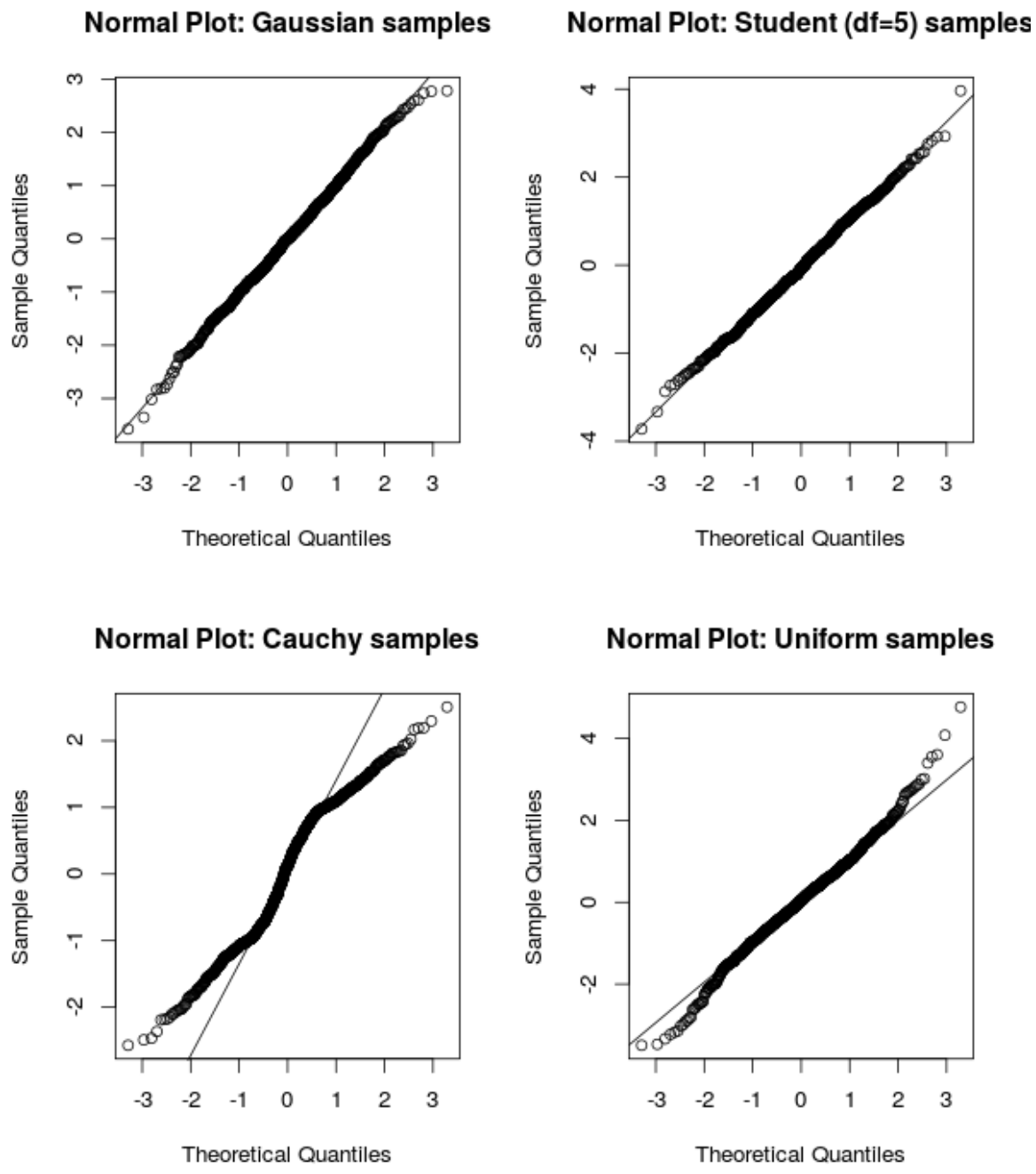
```
> campsimulati <- runif(n*Nsim)

> campsimulati <- matrix(campsimulati, ncol=n)
> lmom <- t(apply(campsimulati, 1, Lmoments))
> vlmom <- t(apply(campsimulati, 1, varLmoments, matrix=FALSE))
> l3 <- lmom[,"lca"]*lmom[,"l2"]
> sl3 <- sqrt(vlmom[,"var.l3"])

> l3unif <- l3/sl3
```

Plot the result:

```
> layout(matrix(c(1,2,3,4), 2, 2, byrow = TRUE))
> qqnorm(l3gaussian, main="Normal Plot: Gaussian samples")
>  qqline(l3gaussian)
> qqnorm(l3student, main="Normal Plot: Student (df=5) samples")
>  qqline(l3student)
> qqnorm(l3cauchy, main="Normal Plot: Cauchy samples")
>  qqline(l3cauchy)
> qqnorm(l3unif, main="Normal Plot: Uniform samples")
>  qqline(l3unif)
```



Normal quantile plots and added line for $N = 1000$ simulated values of $l_3/SE(l_3)$ from Gaussian, Student(5), Cauchy and Uniform samples of size $n = 60$.

References

Elamir, E.A.H., and Seheult, A.H. (2004). Exact variance structure of sample L-moments. *Journal of Statistical Planning and Inference*, 124:337–359.