Figure 1 in Elamir and Seheult (2004)

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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)
```

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.

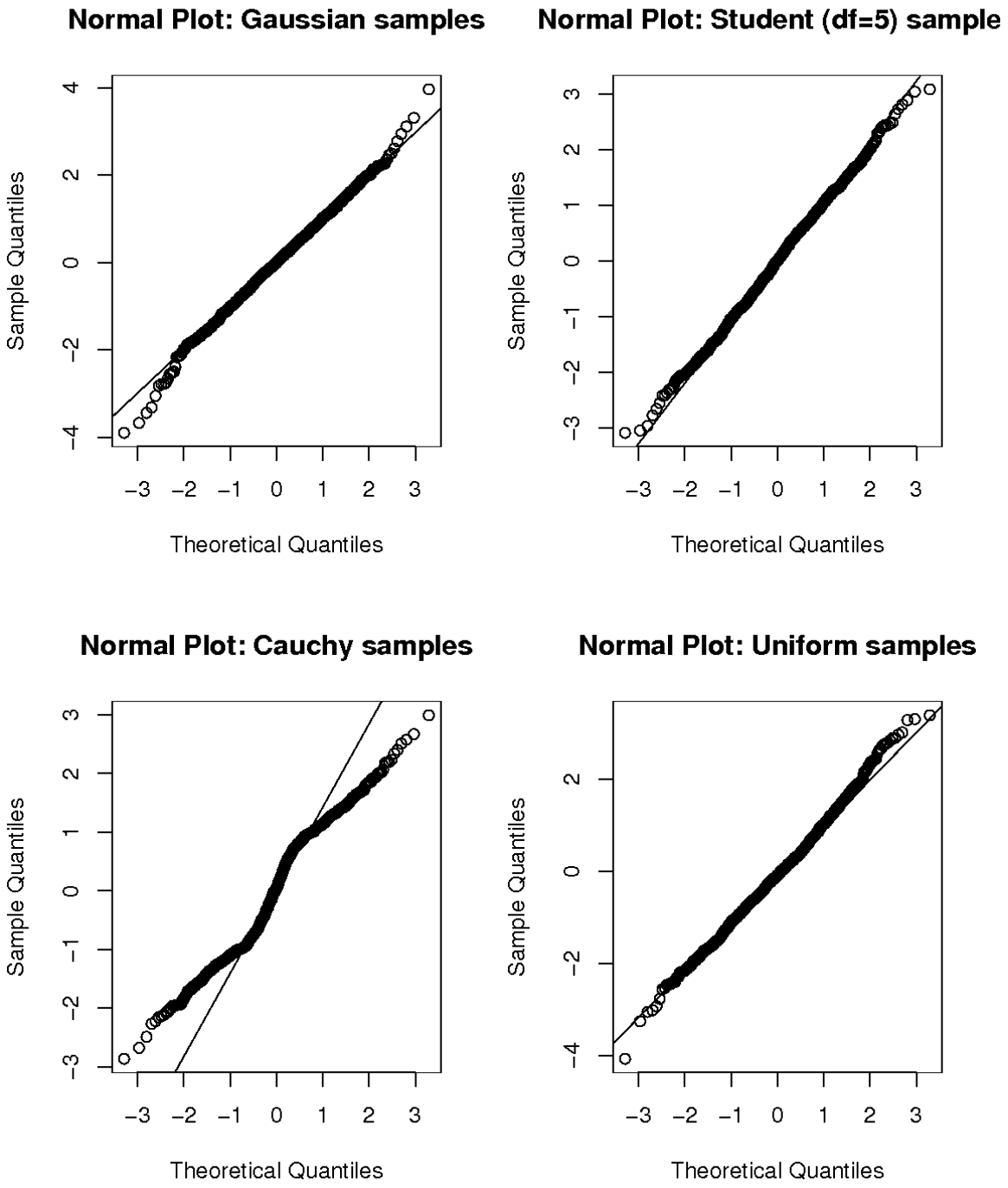

Figure 1: Normal quantile plots and added line for $N = 1000$ simulated values of $l_3/SE(l_3)$ from Gaussian, Student(5), Cauchy and Uniform samples of size $n = 60$.