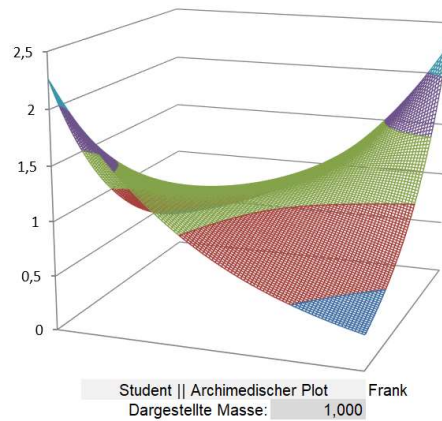
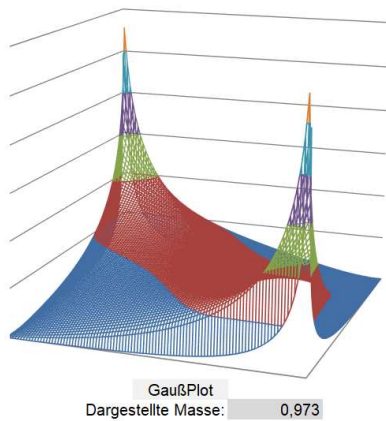


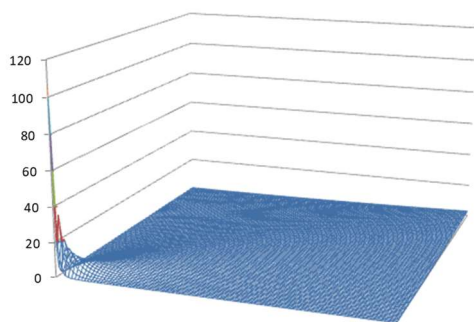
Copula Modelle

Die Berechnung ist zeitaufwendig (n=100 mit Intel i3Core ca 35s)

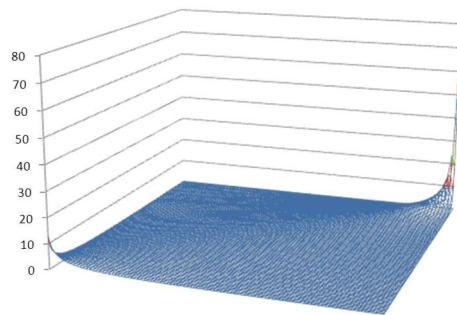


- Beispiele von Copula-Dichten mit jeweils $\tau = 0,5$ bzw. $\rho = 0,5$

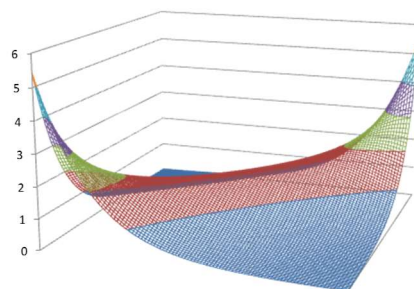
I. archimedische Copula-Dichten



Cook-Johnson-Copula mit $\theta=2$ (Masse = 1,0032)

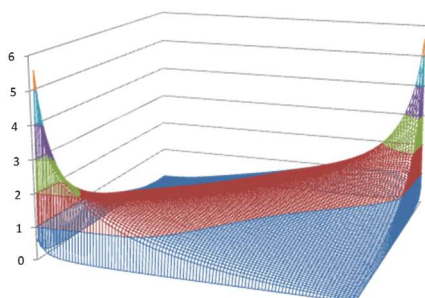


Gumble-Copula mit $\theta=2$ (Masse = 1,0018)

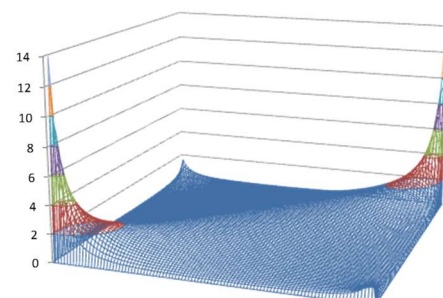


Frank-Copula mit $\theta=5,734$ (Masse = 1,0000)

II. elliptische Copula-Dichten



Gauß-Copula mit $\rho = 0,5$ (Masse = 0,9633)



Student-Copula mit $\rho = 0,5$ (Masse = 0,9650)

Vergleichsmöglichkeit mit R-Quellcode:

<http://www.rankingweb.de/Skripte/ModellierungsfreiheitenCookJohnsonCopula.pdf>

R-Quellcode in der Version aktualisiert **R-3.6.0**

```
library(rpanel)
require("copula")
require("copBasic")

cop.draw <- function(slide) {
  par(mfrow = c(2, 2))
  tau<-slide$KendallTau
  t <- c(copClayton@iTau(tau), copGumbel@iTau(tau), copFrank@iTau(tau))
  cm<-0.8
  ca<-0.6
  cl<-0.7
  cp<-c("clayton","gumbel","frank")
  cc<-c("lightgreen", "lightgray", "lightblue")

  for (i in 1:3)
    { persp(archmCopula(cp[i], t[i], dim = 2), dCopula, main=paste(cp[i], " : theta =",
round(t[i],digits=3)),
  cex.main=cm, col=cc[i], theta=30, phi=30,
  ticktype="detailed", cex.axis=ca, cex.lab=cl) }

  ro<-sin(tau*pi/2)
  persp(normalCopula(0.5, dim = 2, dispstr = "ex"), dCopula,
  main=paste("Normal: roh = ",round(ro, digits=3)),
  cex.main=cm, col="lightyellow", theta=30, phi=30,
  ticktype="detailed", cex.axis=ca, cex.lab=cl)

  par(mfrow = c(1, 1))
  slide }

slide <- rp.control(KendallTau = 0.5)
rp.slider(slide, KendallTau, 0, 1, showvalue = TRUE, resolution=0.05, cop.draw)
```

Ergebnis

