R 이론적 확률분포 2

- **연속형 확률변수 X가 실수구간 [a,b]에서 나타날 가능성이 균등할 때, X는 균등분포를 따른다고 하며 X~U(a,b)**
- **확률밀도함수는 다음과 같음**

$$f(x) = \begin{cases} \frac{1}{b-a}, & a \le X \le b \\ 0, & \text{다른 곳에서} \end{cases}$$

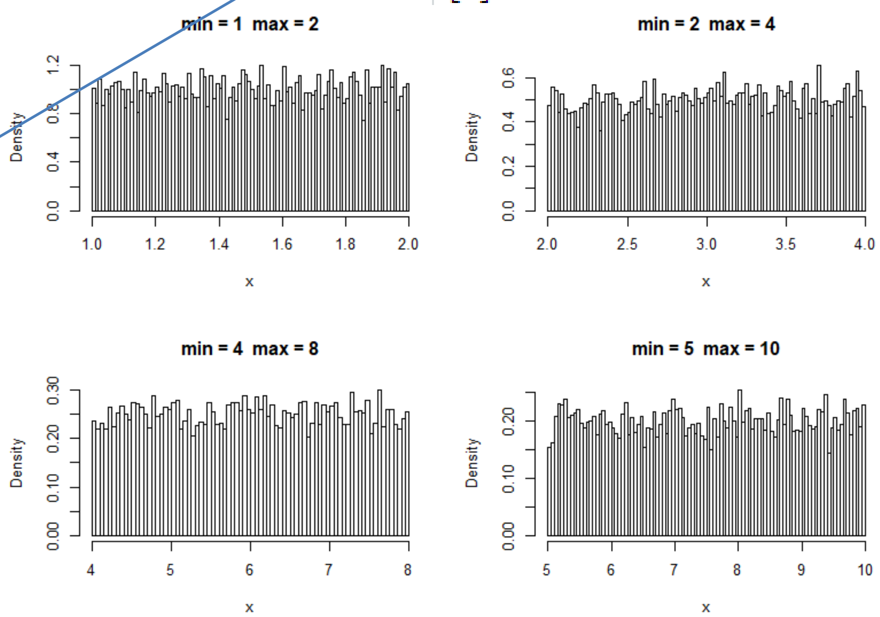
- **X가 X~U(a,b)라고 할 때, X의 평균은 $\frac{b+a}{2}$, 분산은 $\frac{1}{12}(b-a)^2$**

```
> (munif1<-mean(unif1))
[1] 1.500681
> (munif2<-mean(unif2))
[1] 2.993355
> (munif3<-mean(unif3))
[1] 5.999272
> (munif4<-mean(unif4))
[1] 7.474975
```

```
> (vunif1<-var(unif1))
[1] 0.08240007
> (vunif2<-var(unif2))
[1] 0.3336517
> (vunif3<-var(unif3))
[1] 1.320054
> (vunif4<-var(unif4))
[1] 2.077339
```

b1-ch4-8.R

```
set.seed(12345)
n<-10000;
min_list<-c(1,2,4,5)
max_list<-c(2,4,8,10)
par(mfrow=c(2,2))
unif1<-runif(n, min=1, max=2);unif2<-runif(n, min=2, max=4)
unif3<-runif(n, min=4, max=8);unif4<-runif(n, min=5, max=10)
(munif1<-mean(unif1));(munif2<-mean(unif2))
(munif3<-mean(unif3));(munif4<-mean(unif4))
(vunif1<-var(unif1));(vunif2<-var(unif2))
(vunif3<-var(unif3));(vunif4<-var(unif4))
for (i in 1:length(min_list)) {
  hist(runif(n, min=min_list[i], max=max_list[i]), freq=F, breaks
=100, xlab="x", main=paste("min =", min_list[i], " max =", max
_list[i]))
 }
```



1. 확률함수

- 확률변수 X가 평균 μ, 분산 σ^2을 갖는 정규분포를 따른다고 하면

  $X \sim N(\mu, \sigma^2)$

- 확률밀도함수는 다음과 같음

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2\sigma^2}(x-\mu)^2} \quad , \; -\infty < x < \infty$$

2. 정규화

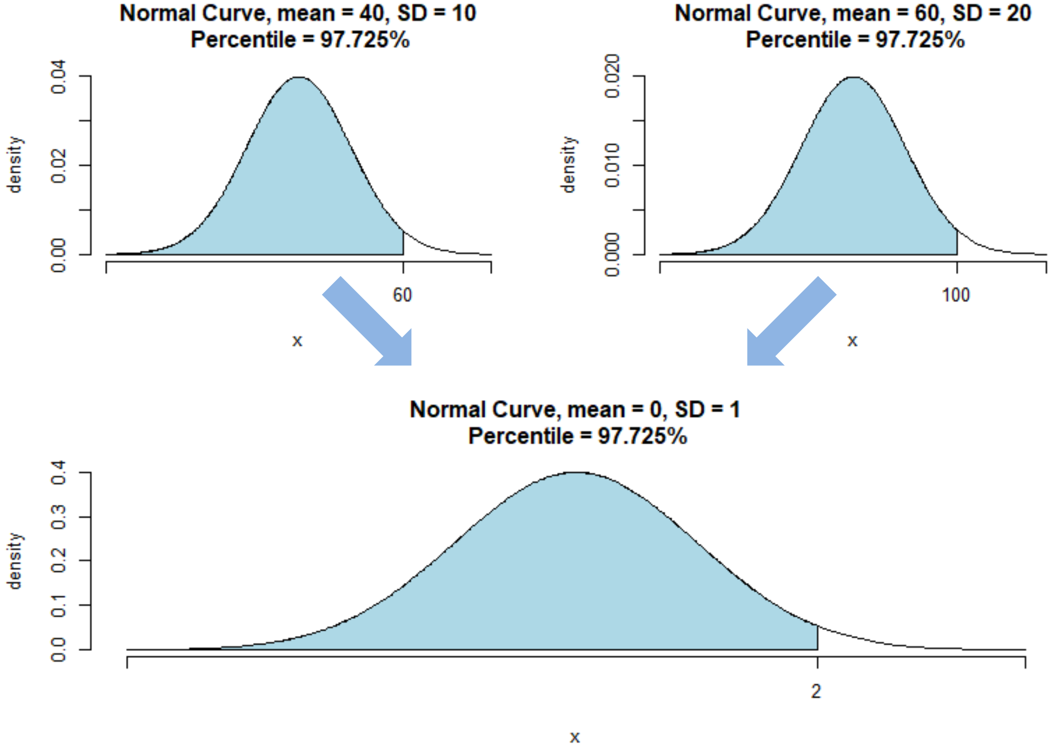
- 확률변수 X에서 X의 평균 μ을 빼주고 표준편차 σ로 나누어 줌

  $Z = \frac{X-\mu}{\sigma}$

b1-ch4-9-new.R

```
library(tigerstats)

(m<-matrix(c(1,2,3,3), ncol=2, byrow=T))
layout(mat=m)
qnormGC(0.97725,region="below",m=40,s=10, graph=T)
qnormGC(0.97725,region="below",m=60,s=20, graph=T)
qnormGC(0.97725,region="below",m=0,s=1, graph=T)
뒤에 계속
```



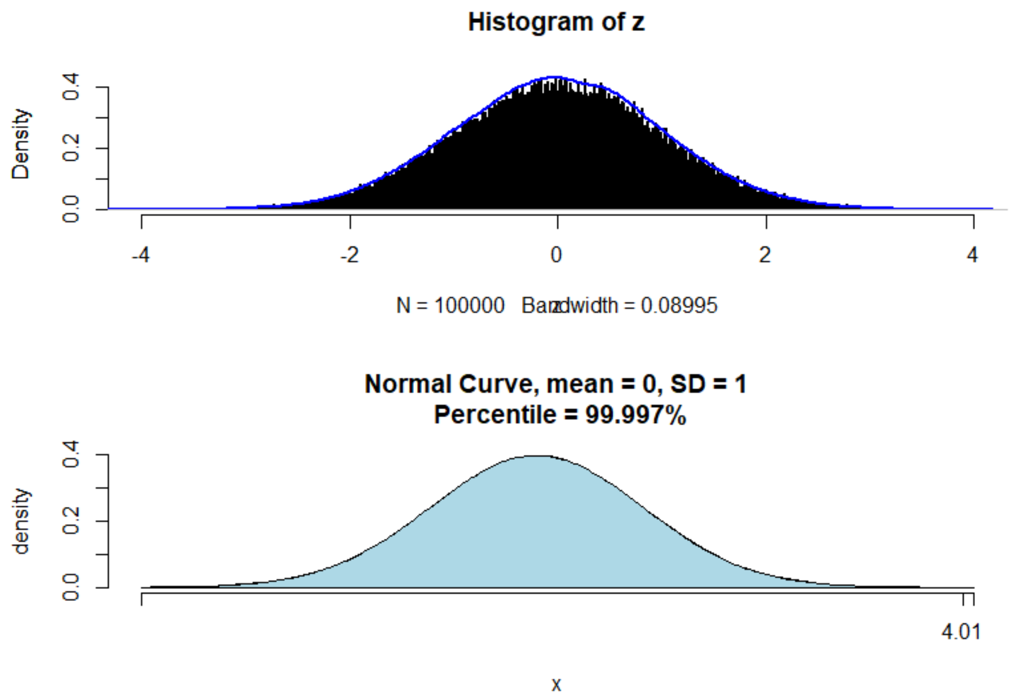
1. 확률함수

- 확률변수 X가 평균 0과 표준편차 1을 갖는 정규분포 즉, 표준정규분포를 따른다고 하면
  X~N(0, 1)
- 확률밀도함수는 다음과 같음

$$f(z)=\frac{1}{\sqrt{2\pi}}e^{-\frac{1}{2}z^2} \quad , \; -\infty < z < \infty$$

b1-ch4-9-new.R

```
앞에서 계속
set.seed(1234)
n<-100000
z<-rnorm(n,0,1)
(mean(z))
(sd(z))
par(mfrow=c(2,1))
hist(z, freq=F,xlim=c(-4,4),breaks=1000)
par(new=T)
plot(density(z), axes=F, main="", xlim=c(-4,4), lwd=2, co
l="blue")
qnormGC(0.99997,region="below",m=0,s=1, graph=T)
```



2. 확률분포표

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879

b1-ch4-9.R

```
z00<-rep(NA,10);z01<-rep(NA,10);z02<-rep(NA,10);z03<-rep(NA,10);z04<-rep(NA,10)
for(i in 1:10) {z00[i]<-pnorm((i-1)/100, 0, 1)-0.5}
(z00<-round(z00, digits=4))
for(i in 10:19) {z01[i]<-pnorm(i/100, 0, 1)-0.5}
(z01<-round(z01[10:19], digits=4))
for(i in 20:29) {z02[i]<-pnorm(i/100, 0, 1)-0.5}
(z02<-round(z02[20:29], digits=4))
for(i in 30:39) {z03[i]<-pnorm(i/100, 0, 1)-0.5}
(z03<-round(z03[30:39], digits=4))
for(i in 40:49) {z04[i]<-pnorm(i/100, 0, 1)-0.5}
(z04<-round(z04[40:49], digits=4))
zdist<-rbind(z00,z01,z02,z03,z04)
(zdist<-round(zdist, digits=4))
```

```
> (zdist<-round(zdist, digits=4))
      [,1]   [,2]   [,3]   [,4]   [,5]   [,6]   [,7]   [,8]   [,9]  [,10]
z00 0.0000 0.0040 0.0080 0.0120 0.0160 0.0199 0.0239 0.0279 0.0319 0.0359
z01 0.0398 0.0438 0.0478 0.0517 0.0557 0.0596 0.0636 0.0675 0.0714 0.0753
z02 0.0793 0.0832 0.0871 0.0910 0.0948 0.0987 0.1026 0.1064 0.1103 0.1141
z03 0.1179 0.1217 0.1255 0.1293 0.1331 0.1368 0.1406 0.1443 0.1480 0.1517
z04 0.1554 0.1591 0.1628 0.1664 0.1700 0.1736 0.1772 0.1808 0.1844 0.1879
```