

R examples

Note: the texts after # are comments.

Note: If you have questions regarding a specific command, for example, you forget what are the first and second arguments when you apply `pnorm()` function, you can simply put a “?” before the command, a help page will guide you through the details of the command; see below

?pnorm

- Cumulative probability for normal random variables, the command looks like `pnorm(x, μ, σ)`

– e.g. 1: $P(Z < 2)$, where $Z \sim N(0, 1)$, do

```
pnorm(2, 0, 1)
```

– e.g. 2: $P(X > 0)$, where $X \sim N(-2, 4)$, do

```
1-pnorm(0, -2, 4)
```

- Find a z-score with a corresponding cumulative probability ($\leq$), the command looks like `qnorm(p, μ, σ)`

– e.g. 1: $P(Z < z) = 0.3$, find z, where $Z \sim N(0, 1)$, do

```
qnorm(0.3, 0, 1)
```

– e.g. 2: $P(X > x) = 0.8$, find x, where $X \sim N(-2, 4)$, do

```
qnorm(0.2, -2, 4) #note: the area to the left of x is 1-0.8=0.2
```

- Curve a function, first define a function in R, then curve it!

– e.g.1: Curve pdf of χ^2_{19}

```
#First we define a function, called chisq19
##Note: dchisq() specifies the pdf of chisq distribution
chisq19<-function(x) dchisq(x,19)

#Now we curve it from x=0 to x=10
curve(chisq19,0,10)
```

- Density curve of standard normal (Z) and t distribution (with $df = 2, 10, 20, 30, 100$)

```
##Standard normal density plot
normal<-function(x) dnorm(x)
curve(normal, col="red",lwd=3,-3,3)
```

```
##Impose a t_2 distribution
t2<-function(x) dt(x,2)
curve(t2, lwd=3,add=T)
```

```
##Impose a t_10 distribution
t10<-function(x) dt(x,10)
curve(t10, lwd=3,add=T)
```

```
##Impose a t_20 distribution
t20<-function(x) dt(x,20)
curve(t20, lwd=3,add=T)
```

```
##Impose a t_30 distribution
t30<-function(x) dt(x,30)
curve(t30, lwd=3,add=T)
```

```
##Impose a t_100 distribution
t100<-function(x) dt(x,100)
curve(t100, lwd=3,add=T)
```

- Code to verify CLT

```
# program to approximate the sampling distn of X-bar
# for several values of n
```

```

# Choosing a sample size:
my.n <- 3 #also try 10,15,30

number.samples <- 10000 # Examining 10000 values of X-bar

# Sampling from standard exponential population:
skewed.data <- matrix(rexp(my.n * number.samples),
                      nrow=number.samples, ncol=my.n)

xbar.values <- apply(skewed.data, 1, mean)

hist(xbar.values)

```

- Chapter 8, example 1, plot $\text{MSE}(\hat{p}) - \text{MSE}(\hat{p}^*)$

```

n=10
fun<-function(p) p*(1-p)/n - (n*p-n*p*p+1-4*p+4*p*p)/(n+2)^2

curve(fun,0,1,xlab="p")
abline(h=0,lty=2)

```