Lecture_2_MACSS

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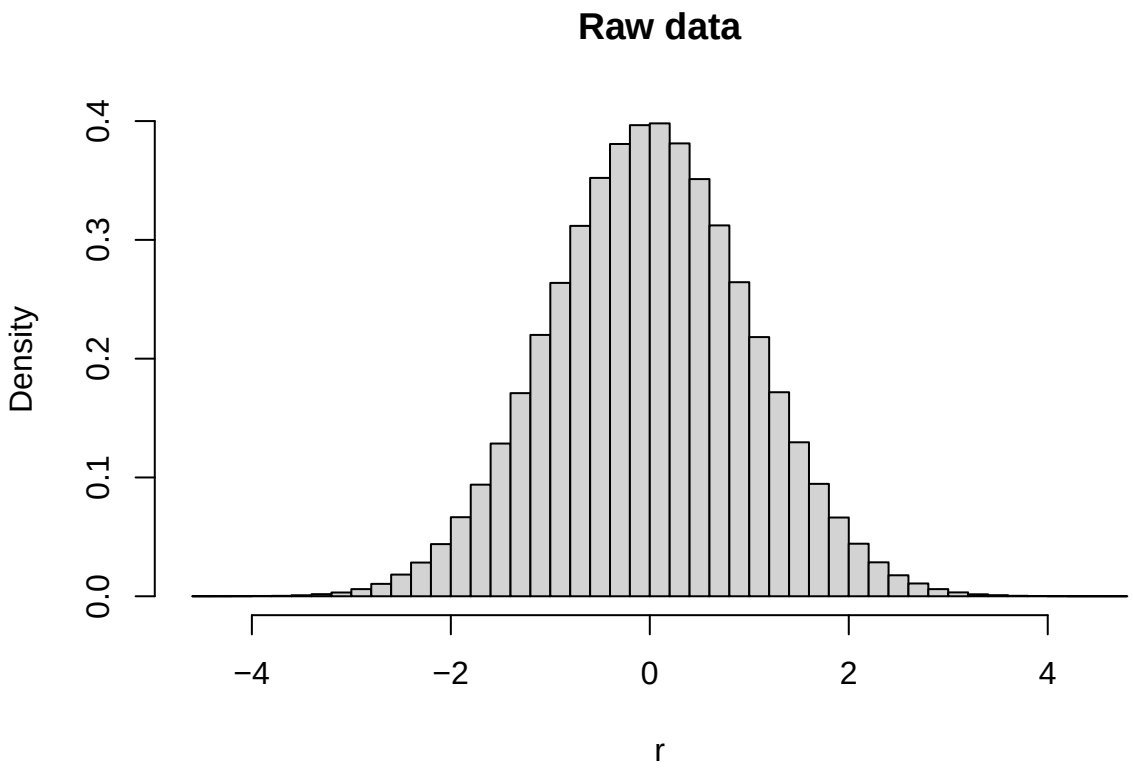
```r
rm(list = ls()) # clear memory

set.seed(22092008) # set random number generator seed

N<-1000000 # population size

n <- 10 # sample size (for calculation of mean)
numloop <- 10000 # number of draws

# Placeholder
g <- integer(numloop) # vector to hold sample mean for each iteration

# # For normally distributed data
sig2 <- 1 # variance for population
mu <- 0 # mean of population
r <- rnorm(N, mean=mu,sd=sqrt(sig2))

# For uniformly distributed data
# ub <- 10
# lb <- -10
# r <- runif(N, min = lb, max = ub)
# sig2 <- (lb-ub)^2/12 # variance for uniform (SCIENCE!)

# Plot population
hist(r,prob=TRUE,breaks = 50,main = "Raw data")
```

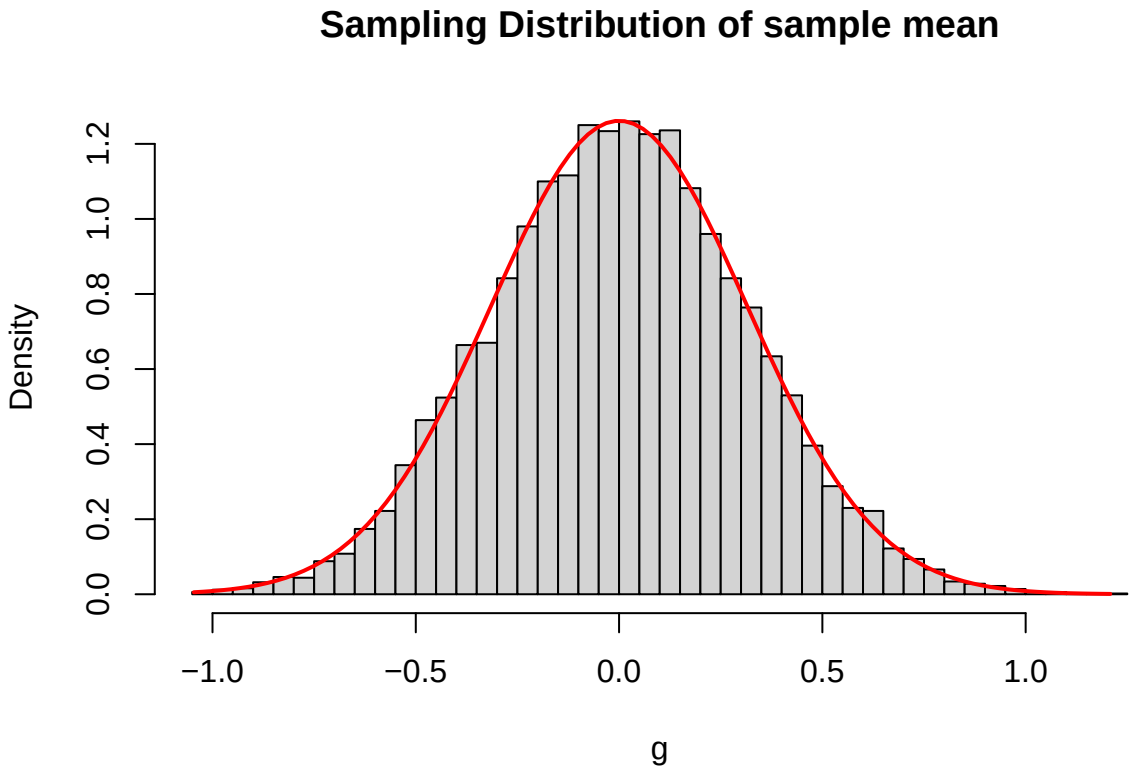



```
readline(prompt="Press [enter] to continue")
```

```
## Press [enter] to continue
```

```
## [1] ""
```

```
# Draw `numloop' samples of size n and calculate mean each time.

for(i in 1:numloop) {
  tmp <-sample(r, n, replace = FALSE, prob = NULL)
  g[i] <- mean(tmp)
}

# Calculate minimum and maximum of sample means (cleaner plot)
a <-min(g)
b <-max(g)


# Make histogram of sample means with 50 bins
hist(g,prob=TRUE,breaks = 50,main = "Sampling Distribution of sample mean")

# Overlay normal distribution with predicted mean and variance
curve(dnorm(x,mean=0,sd=sqrt(sig2/n)),a,b,add=TRUE,lwd=2,col="red")
```



Now let's turn R into a calculator to calculate critical values and p-values.

```
# If you want to look up critical values based on a certain amount of probability mass in the tail for
qnorm(0.025)
```

```
## [1] -1.959964
```

```
# This looks up the critical value on a normal pdf, with 0.025 probability mass to the left of it. If y
qnorm(0.975)
```

```
## [1] 1.959964
```

```
#If you have a critical value and want to look up the probability mass, you do.....
pnorm(-1.96)
```

```
## [1] 0.0249979
```

```
# This gives you the probability mass to the left of -1.96 z-scores. If you want to calculate the area
1-pnorm(1.645)
```

```
## [1] 0.04998491
```

```
# Cool. What about t-distributions?
# Well, you need one more parameter. The degrees of freedom.
# So if you want the area in the tail to the left of a t of -2.23 with 23 degrees of freedom, you do...
pt(-2.23,23)
```

```
## [1] 0.01789719
```

```
# or if you want to figure out what the critical value for a certain alpha is given the degrees of free
qt(0.05,23)
```

```
## [1] -1.713872
```

Now chuck your t and normal tables forever!!!!