Notes 4/10/19

Random Values Continued –Theory

* 100(1+r) where r is a random rate
  + We used rnorm() last time to generate this distribution
    - Could also use rbinom(), rbeta(), rgama()
      * All of them are **Random Number Generators** (actually pseudorandom)
        + Use a deterministic process, but practically they are random
* Linear Congruential Generator
  + Simplified version:
    - Ingredients: X0 🡨 initial value or ‘seed’, a 🡨 multiplier, b 🡨 modulus
      * All three are integers with certain rules:
        + Seed must be > 0 but < modulus
        + Multiplier must be positive but < modulus
        + Modulus must be positive
    - X1 = X0\*a
      * Take this product to find the modulus value (i.e. mod b)
    - X2 = X1\*a mod b
    - Xn =(Xn-1)\*a mod b
  + Common choices for the initial value
    - b is a prime number (original foundation)
    - b is a power of 2 (more efficient and takes advantage of a binary system)
  + Ex: %% is mod in R syntax
    - X0 = 17, A = 3, B = 64
      * X0,X1,X2,… 🡪 17, (17\*3) %% 64 = 51, (51\*3) %% 64 = 25, …

Example in R:

# Congruential Generator

Cong <- Function(n=1, seed= , a= , b= ) {

X <- rep(0,n)

If(n==1) {

X[1] <- seed \*a $$ b

} else {

For(I in 2:n) {

X[i] <- (x[i-1]\*a) %% b

}

Return(x)

}

}

Rnorm is not good for reproducibility

* Can use the function set.seed() to preserve the values of a simulation
* Ex:

Set.seed(*integer*)

Rnorm(n=?,mean=?,sd=?)

Then to get the rnorm values back just:

Set.seed(*integer*)

Rnorm(n=?,mean=?,sd=?)

Can set a selectInput() in shiny to allow users to determine a random seed, for reproducibility

*Ex:*

*Code from last time – 4/8/19:* ***(Changes to add a seed in bold)***

server(input,output) {

reactive({

balance <- c(input$initial, rep(0, input$years)

**set.seed(input$seed)**

rates <- **rnorm(input$years, input$mean, input$sd)**

for(y in 1:input$years) {

rates[y] <- rnorm(1, input$mean, input$sd)

balance[y+1] <- balance[y] \* (1+ rates[y])

}

dat <- data.frame(

Year = 0:years,

Rate = c(0, rates),

Balance = balance

)

return(dat)

})