R Coursework 2

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Oct 19th, 2020

```
# Import Packages
library(tidyverse)
library(ggplot2)
```

Question 1

```
R_1 <- 30
F_1 <- 40

pred_number_i <- function(t, Rt=R_1, Ft=F_1, a=0.05, b=0.0001, g=0.02, choice="t") {

  for (i in 1:t) {

    Rt_1 <- Rt + a * Rt - b * Rt * Ft
    Ft_1 <- Ft + b * Rt * Ft - g * Ft
    Rt <- Rt_1
    Ft <- Ft_1

  }

    if (choice == "r") {

      return(Rt)

    } else if (choice == "f") {

      return(Ft)

    } else if (choice == "t") {

      return(c(Rt, Ft))

    } else {

      stop("Str Input Error")

    }


}
```

```
r_i <- pred_number_i(103)
print(r_i)
```

```
## [1] 1234.468 1534.849
```

As a result, the number of foxes is 1534.8487313, and that of rabbits is 1234.4681578 in week 103.

Question 2

```
pred_number_ii <- function(t, Rt=R_1, Ft=F_1, a=0.05, b=0.0001, g=0.02, choice="t") {
  set.seed(60854)
  for (i in 1:t) {

    Rt_1 <- Rt + rbinom(1, Rt, a) - rbinom(1, Rt * Ft, b)
    Ft_1 <- Ft + rbinom(1, Rt * Ft, b) - rbinom(1, Ft, g)
    Rt <- Rt_1
    Ft <- Ft_1

  }

    if (choice == "r") {

      return(Rt)

    } else if (choice == "f") {

      return(Ft)

    } else if (choice == "t") {

      return(c(Rt, Ft))

    } else {

      stop("Str Input Error")

    }

}

r_ii <- pred_number_ii(103)
print(r_ii)
```

```
## [1] 1003 1209
```

As a result, the number of foxes is 1209, and that of rabbits is 1003 in week 103.

Question 3

```
# Creat DataFrame
t_iii <- seq(1, 103)
det_rabbits <- sapply(t_iii, pred_number_i, choice = "r")
det_foxes <- sapply(t_iii, pred_number_i, choice = "f")
```

```r
sto_rabbits <- sapply(t_iii, pred_number_ii, choice = "r")
sto_foxes <- sapply(t_iii, pred_number_ii, choice = "f")
group_iii <- factor(c(rep("det_rabbits", length(t_iii)),
                      rep("det_foxes", length(t_iii)),
                      rep("sto_rabbits", length(t_iii)),
                      rep("sto_foxes", length(t_iii))))
t_rep_iii <- rep(t_iii, 4)
l_iii <- c(det_rabbits, det_foxes, sto_rabbits, sto_foxes)
LV <- data.frame(time = t_rep_iii, size = l_iii, group = group_iii)
```

```r
# Plot
p <- ggplot2::ggplot(LV, ggplot2::aes(x = time, y = size, group = group, color = group)) +
  ggplot2::geom_line()
p
```