

SEIR epidemic with equal births and deaths

```
## It is the SEIR epidemic with equal births and deaths.
## Note we no-longer explicitly model the recovered class.

## Parameters:
# miu: Per capita death rate, and the population level birth rate;
# beta: Product of contact rates and transmission probability;
# gamma: Recovery Rate;
# sigma: The rate at which individuals move from the exposed to the infectious
class;
# S: Proportion of the population that are susceptible;
# E: Proportion of the population that are exposed;
# I: Proportion of the population that are infectious;
# R: Proportion of the population that are recovered.

library(deSolve)

SEIR = function(time, state, pars) {
  with(as.list(c(state,pars)), {
    dS = miu - (beta * I0 + miu) * S0
    dE = beta * S0 * I0 - (miu + sigma) * E0
    dI = sigma * E0 - (miu + gamma) * I0
    dR = gamma * I0 - miu * R0
    return(list(c(dS,dE,dI,dR)))
  })
}

yini = c(S0 = 0.8,E0 = 1e-4,I0 = 1e-4,R0 = 1-0.8-2e-4)
pars = c(miu = 1/(70*365), beta = 1.4247,gamma = 0.14286, sigma = 0.07143)
times = seq(0,100,by = 1)

out = ode(func = SEIR, y = yini, parms = pars, times = times)
out = as.data.frame(out)
out$time = NULL

matplot(times,out,type = "l", xlab = "Time(days)", ylab = "Susceptibles and
Recovereds", main = "SEIR Model",
        lwd = 2, lty = 1, col = 2:5)
legend(60,0.5,c("Susceptibles","Exposeds","Infecteds","Recovereds"),pch = 1,
col = 2:5, bty = "n")
```

SEIR Model

