Insurance Exercise

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First i will initialize all the variables that i will need for the simulation in the first loop. this loop will simulate 10000 times the scenario we are given.

```
num_simulations <- 10000
number_of_cars_sold <-0
fee<-0
estimated_probability_bankrupt<-0
bankrupt_count<-0
```

Now our simulation starts.

```
for (i in 1:num_simulations) {
  #again i initialize the variables for the inner loop.
  payout_count<-0
  damage_amount <-0
  total_damage_amount <- 0
  # Simulate #of cars using Poisson with mean 10
  number_of_cars_sold <- rpois(1, 10)

  #Now that we have a random number of cars sold,
  #i will run a loop for this amount of cars
  for (j in 1:number_of_cars_sold) {
    if (payout_count == 10) {
      break  # Exit the loop when payout_count reaches 10
    }
  # Simulate whether it's the first or second car
  is_second_car <- rbinom(1, 1, 0.6)

  if (is_second_car==1) {
    mileage <- rnorm(1, 8000, 40000)
  } else {
    mileage <- rnorm(1, 16000, 2500)
  }
  # Simulate time to first damage
  time_to_damage <- rexp(1, 1 / 20) # Exponential distribution

  #if the conditions are met we will have to randomly create ,
  #an amount for the damage and keep a counter that adds up
  #the total amount that our company will payout.
  if (mileage < 14000 & time_to_damage <12) {
    payout_count <- payout_count + 1
    damage_amount <- rgamma(1, shape = (100^2) / 10000, scale = 10000 / 100)
    total_damage_amount <- total_damage_amount + damage_amount

  }
  }
  #each time i will divide our cost to the amount of clients
  #as the number of clients increases the cost will get lower but
  #the probability of our conditions to be met will be higher
  #so the risk wil be greater
  fee<-total_damage_amount/number_of_cars_sold
  if (total_damage_amount > fee*number_of_cars_sold) {
    bankrupt_count <- bankrupt_count + 1
  }
  estimated_probability_bankrupt <- bankrupt_count / num_simulations

  #the moment the probability drops under 0.01
  #our loop will break and give us the calculated fee
  if(estimated_probability_bankrupt<0.01){
    break
  }
}
```

Finally we will print the fee

```
cat("Calculated Fee:", fee, "\n")
```

```
## Calculated Fee: 58.73973
```