Ploting model 3 with R

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Contents

Problem

According to the Model 3 in chapter 2 of Loss Models from Data to Decision Edition 5, We know that

Model 3 This random variable could serve as a model for the number of claims on one policy in one year. Probability is concentrated at the five points (from 0 to 4) and the probability at each is given by the size of the jump in the distribution function:

$$F_3(x) = \begin{cases} 0, & x = 0 \\ 0.5, & 0 \leq x < 1 \\ 0.75, & 1 \leq x < 2 \\ 0.87, & 2 \leq x < 3 \\ 0.95, & 3 \leq x < 4 \\ 0.1, & 4 \leq x \end{cases}$$

drow plot of Distribution, Density, Survial, Hazard rate function of this Random Variable.

Calculating Distribution function

According to the last slide we now that our cummulative distribution function is:

$$F_3(x) = \begin{cases} 0, & x = 0 \\ 0.5, & 0 \leq x < 1 \\ 0.75, & 1 \leq x < 2 \\ 0.87, & 2 \leq x < 3 \\ 0.95, & 3 \leq x < 4 \\ 0.1, & 4 \leq x \end{cases} \tag{1}$$

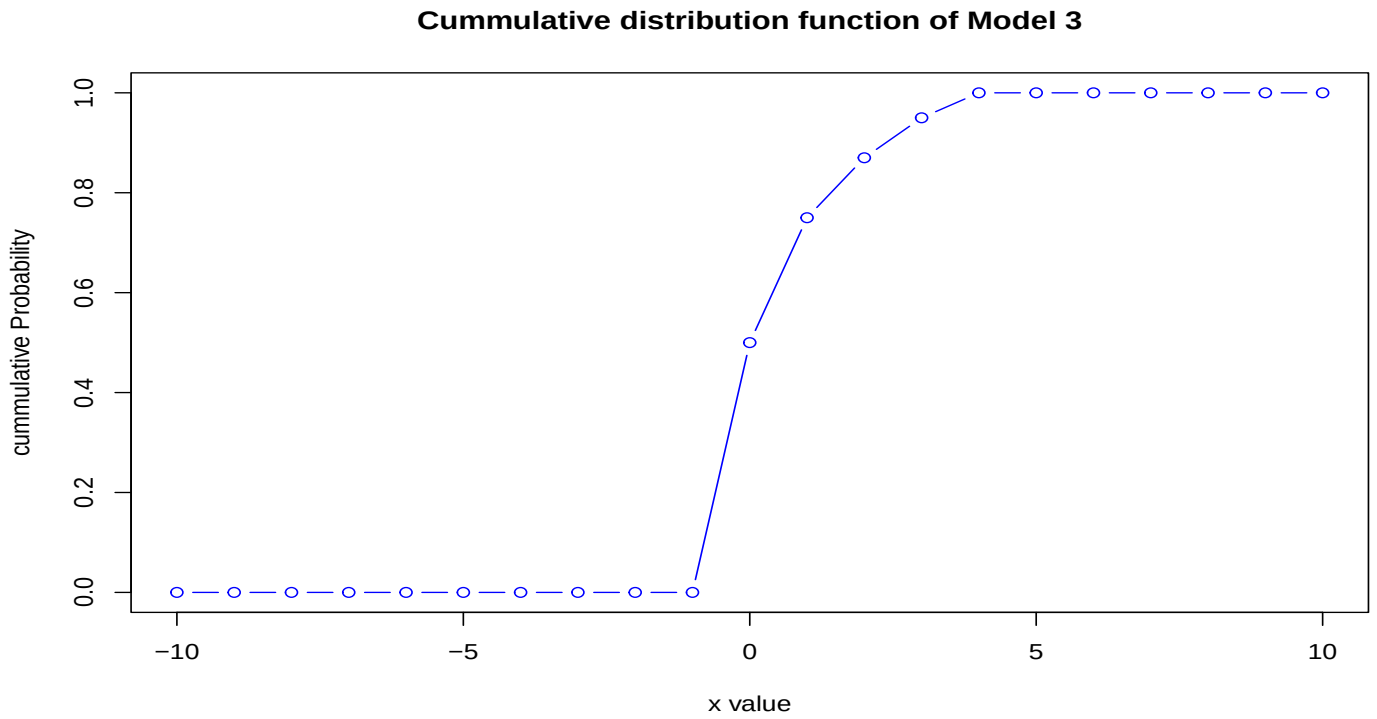
ploting Cummulative distribution function of Model 3

```
F_x3 = function(x){
  if(x < 0){
    prob = 0
  }
  if((x<1)&(x>=0)){
    prob = 0.5
  }
  if((x<2)&(x>=1)){
    prob = 0.75
  }
  if((x<3)&(x>=2)){
    prob = 0.87
  }
  if((x<4)&(x>=3)){
    prob = 0.95
  }
  if(x>=4){
    prob = 1
  }
  return(prob)
}
#please enter your number (input) as x:
x = 3
F_x3(x)
```

```
## [1] 0.95
```

Ploting Cummulative distribution function of Model 3

```
S = seq(-10 , 10);w = c();k = 1
for(i in S){
  w[k] = F_x3(i)
  k = k+1}
plot(x = S , y = w , col = "blue" , type = "b" ,
     xlab = "x value" , ylab = "cummulative Probability",
     main = "Cummulative distribution function of Model 3")
```



calculating Survial function of Model 3

According to bottem formula for calculating survial function we have:

$$S_X(x) = 1 - F_X(x) \tag{2}$$

So our result is:

$$S_X(x) = \begin{cases} 0.5, & 0 \leq x < 1 \\ 0.25, & 1 \leq x < 2 \\ 0.13, & 2 \leq x < 3 \\ 0.05, & 3 \leq x < 4 \\ 0, & 4 \leq x \end{cases} \tag{3}$$

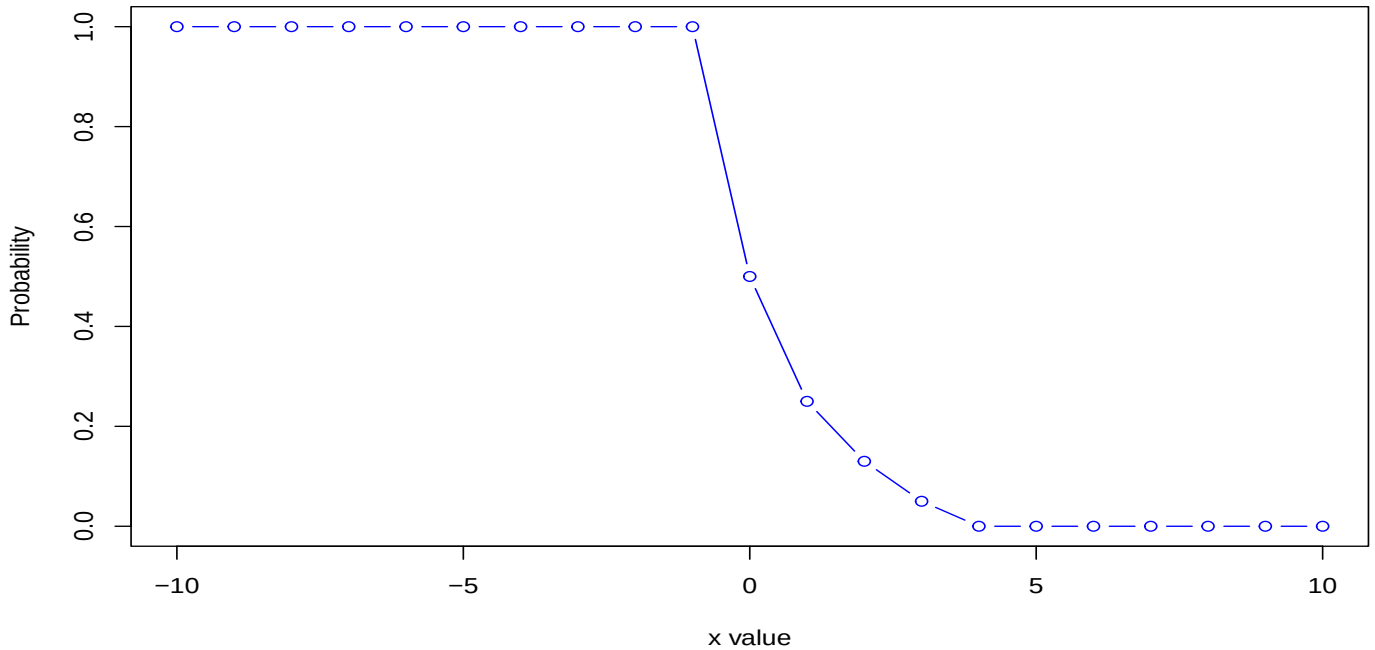
Ploting Survial function of Model 3

```
S_x3 = function(x){
  prob = 1 - F_x3(x)
  return(prob)}
x = 3
S_x3(x)
```

```
## [1] 0.05
```

Ploting Survial function of Model 3

```
S = seq(-10 , 10);q = c();k = 1
for(i in S){
  q[k] = S_x3(i)
  k = k+1}
 plot(x = S , y = q , col = "blue" , type = "b" ,
      xlab = "x value" , ylab = "Probability",
      main = "")
```



calculating probability mass function of Model 3

Now here we want to Calculating the Probability mass function of Model 3 according to the bottem formula:

$$p_X(x) = Pr(X = x) \tag{4}$$

So our result is:

$$p_3(x) = \begin{cases} 0.50, & x = 0 \\ 0.25, & x = 1 \\ 0.12, & x = 2 \\ 0.08, & x = 3 \\ 0.05, & x = 4 \end{cases} \tag{5}$$

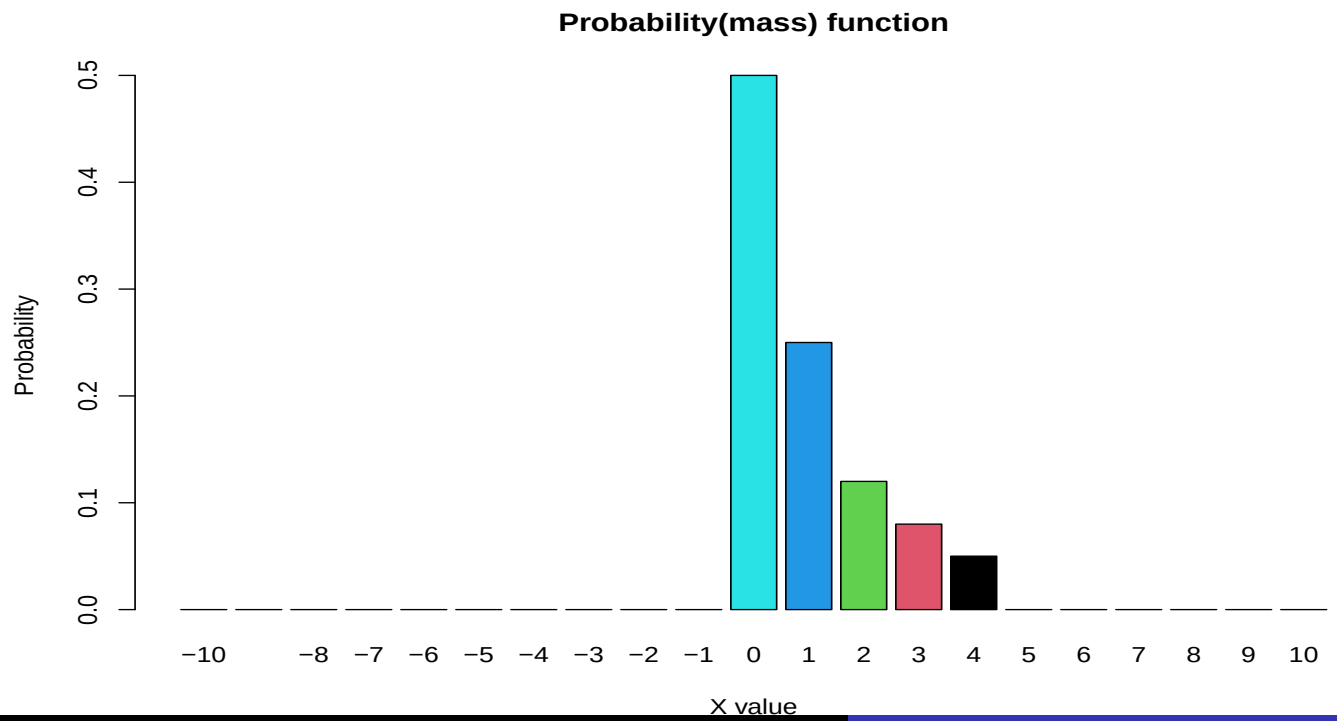
ploting probability mass function of Model 3

```
 f_x3 = function(x){
   prob = F_x3(x) - F_x3(x-1)
   return(prob)
 }
x = 3
f_x3(x)
```

```
## [1] 0.08
```

ploting probability mass function of Model 3

```
S = seq(-10 , 10 );e = c();k = 1
for(i in S){
  e[k] = f_x3(i)
  k = k+1}
barplot( e  ,names.arg = -10:10 ,
         xlab = "X value" , ylab = "Probability" ,
         col = 5:1 , main = "Probability(mass) function")
```



End

- Thanks for your attention