Lista de Exercícios II - Bioestatística (DES4060 - Turma 2022)

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Sumário

Especificações

Encontrar alguma distribuição de probabilidade nova (pelo menos 2 parâmetros) e:

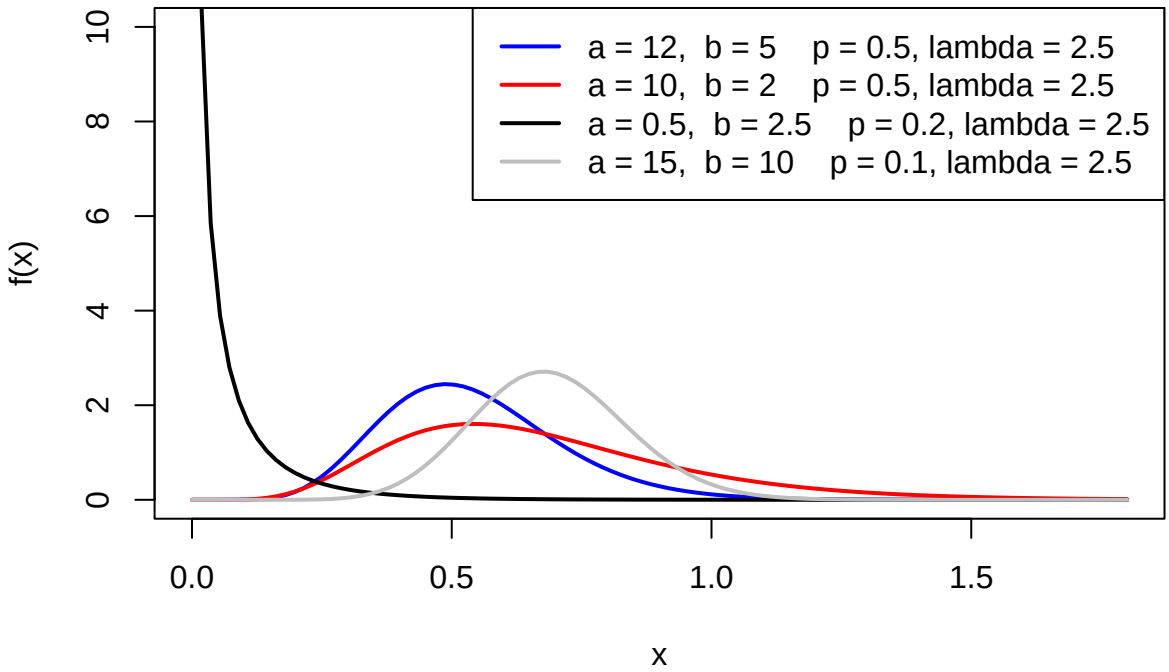
- escrever quem fez, onde usou, como usou, propriedades
- implementar as funções d, p, q r
- fazer figuras
- realizar estudo de simulação (estimação máxima verossimilhança) – variar tamanho da amostra e ver como as estimativas mudam, viés, rmse

Escrever quem fez, onde usou, como usou, propriedades

Implementar as funções d, p, q, r

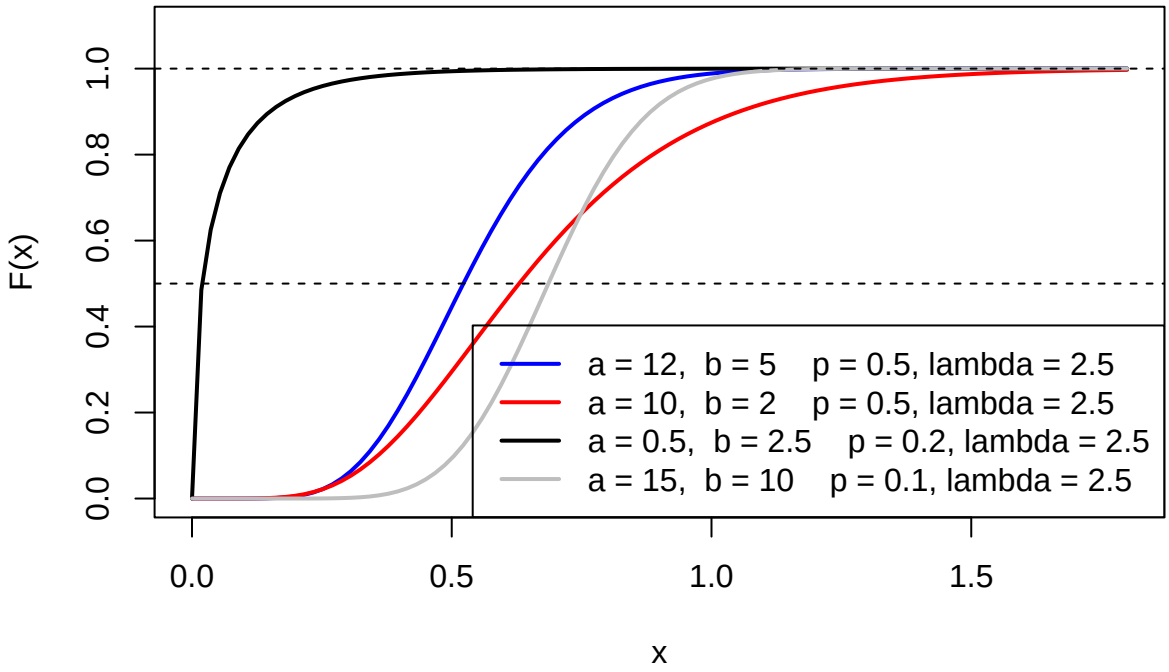
```
# f(x)
dKwMOE <- function(x,a, b, p, lambda)
{
    dexp <- dexp(x=x,rate=lambda)
    pexp <- pexp(q=x,rate=lambda)

    dKwMOE_p1 <- (a*b*(1-p)*dexp*(pexp^(a-1))) / ((1-p*(1-pexp))^(a+1))
    dKwMOE_p2 <- (1 - ((pexp)/(1 - p*(1-pexp)))^a )^(b-1)
    dKwMOE_p1 * dKwMOE_p2
}


dKwMOE_curve <- function(a, b, p, lambda,
                         col="blue",lwd=2,xlab="x",ylab="f(x)",xlim = c(0, 1.8), ylim = c(0, 10),add=FALSE) {
    curve(
        dKwMOE(
            x,
            a = a,
            b = b,
            p = p,
            lambda = lambda
        ),
        col = col, # cor
        #lty=1, # tipo
        lwd = lwd, # tamanho
        xlab = xlab,
        ylab = ylab,
        xlim = xlim,
        ylim = ylim,
        add = add
    )

}


params <- list(a=c(12.0,10.0,0.5,15.0),
               b=c(5.0,2.0,2.5,10.0),
               p=c(0.5,0.5,0.2,0.1),
               lambda=c(2.5,2.5,2.5,2.5),
               col=c("blue","red","black","gray"))

dKwMOE_curve(a = params$a[1],  b = params$b[1], p = params$p[1], lambda = params$lambda[1], col=params$col[1],
dKwMOE_curve(a = params$a[2],  b = params$b[2], p = params$p[2], lambda = params$lambda[2], col=params$col[2],
```

```
dKwMOE_curve(a = params$a[3],  b = params$b[3], p = params$p[3], lambda = params$lambda[3], col=params$col[3],
dKwMOE_curve(a = params$a[4],  b = params$b[4], p = params$p[4], lambda = params$lambda[4], col=params$col[4],
legend(
    "topright",
    legend = c(
        paste0("a = ",params$a[1],",  b = ",params$b[1],"    p = ",params$p[1],", lambda = ",params$lambda[1]),
        paste0("a = ",params$a[2],",  b = ",params$b[2],"    p = ",params$p[2],", lambda = ",params$lambda[2]),
        paste0("a = ",params$a[3],",  b = ",params$b[3],"    p = ",params$p[3],", lambda = ",params$lambda[3]),
        paste0("a = ",params$a[4],",  b = ",params$b[4],"    p = ",params$p[4],", lambda = ",params$lambda[4])
    ),
    lty = 1,
    lwd = 2,
    col = params$col,
)
```



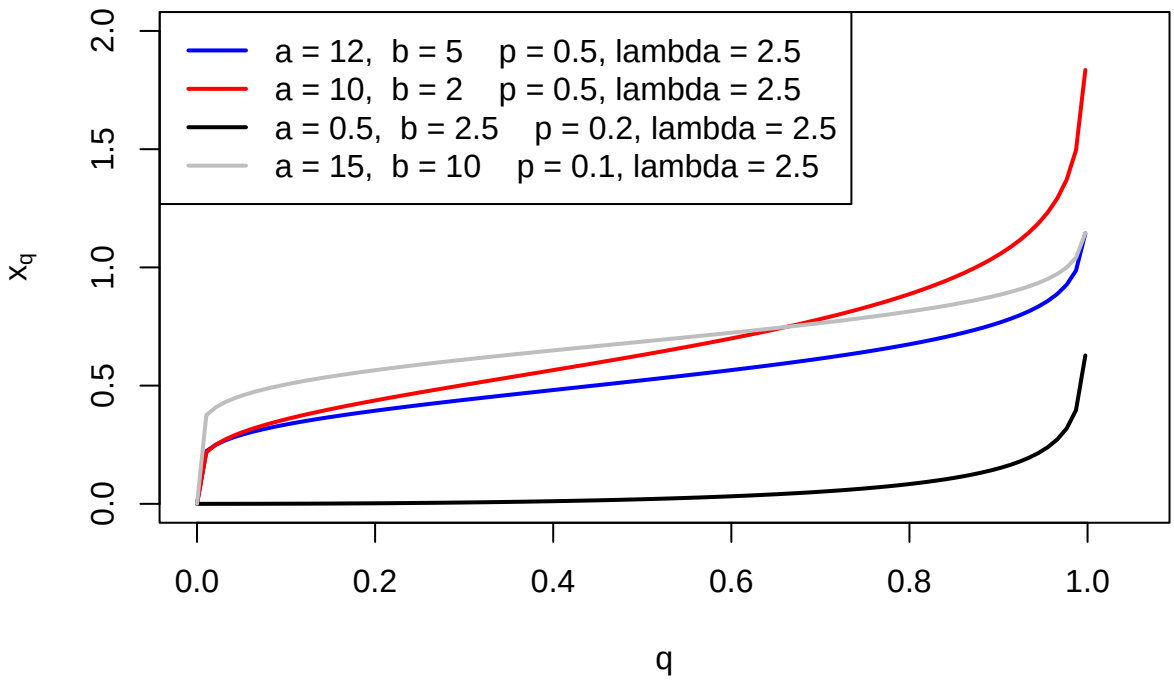

```
# F(x)
pKwMOE <- function(q, a, b, p, lambda)
{
    pexp <- pexp(q=q,rate=lambda)

    1 - (1-(pexp/(1-p*(1-pexp))))^a)^b
}


pKwMOE_curve <- function(x,a, b, p, lambda,
                         col="blue",lwd=2,xlab="x",ylab="F(x)",xlim = c(0, 1.8), ylim = c(0, 1.1),add=FALSE) {
    curve(
        pKwMOE(
            q = x,
            a = a,
```

```
            b = b,
            p = p,
            lambda = lambda
        ),
        col = col, # cor
        #lty=1, # tipo
        lwd = lwd, # tamanho
        xlab = xlab,
        ylab = ylab,
        xlim = xlim,
        ylim = ylim,
        add = add
    )

}


params <- list(a=c(12.0,10.0,0.5,15.0),
               b=c(5.0,2.0,2.5,10.0),
               p=c(0.5,0.5,0.2,0.1),
               lambda=c(2.5,2.5,2.5,2.5),
               col=c("blue","red","black","gray"))

pKwMOE_curve(a = params$a[1],  b = params$b[1], p = params$p[1], lambda = params$lambda[1], col=params$col[1],
pKwMOE_curve(a = params$a[2],  b = params$b[2], p = params$p[2], lambda = params$lambda[2], col=params$col[2],
pKwMOE_curve(a = params$a[3],  b = params$b[3], p = params$p[3], lambda = params$lambda[3], col=params$col[3],
pKwMOE_curve(a = params$a[4],  b = params$b[4], p = params$p[4], lambda = params$lambda[4], col=params$col[4],
legend(
    "bottomright",
    legend = c(
        paste0("a = ",params$a[1],",  b = ",params$b[1],"    p = ",params$p[1],", lambda = ",params$lambda[1]),
        paste0("a = ",params$a[2],",  b = ",params$b[2],"    p = ",params$p[2],", lambda = ",params$lambda[2]),
        paste0("a = ",params$a[3],",  b = ",params$b[3],"    p = ",params$p[3],", lambda = ",params$lambda[3]),
        paste0("a = ",params$a[4],",  b = ",params$b[4],"    p = ",params$p[4],", lambda = ",params$lambda[4])
    ),
    lty = 1,
    lwd = 2,
    col = params$col,
)
abline(h=1,lty=2)
abline(h=0.5,lty=2)
```




```r
qKwMOE <- function(prob=0.5, a, b, p, lambda)
{
    x_q <- (1/lambda)*log( (1 - p*(1-(1-prob)^(1/b))^(1/a) ) / (1 - (1-(1-prob)^(1/b))^(1/a)) )
    x_q
}

qKwMOE_curve <- function(x,a, b, p, lambda,
                         col="blue",lwd=2,xlab="q",ylab = "x_q",xlim = c(0, 1.05), ylim = c(0, 2),add=FALSE) {
    curve(
        qKwMOE(
            prob=x,
            a = a,
            b = b,
            p = p,
            lambda = lambda
        ),
        col = col, # cor
        #lty=1, # tipo
        lwd = lwd, # tamanho
        xlab = xlab,
        ylab= latex2exp::TeX(sprintf(r'($%s$)', ylab)),
        xlim = xlim,
        ylim = ylim,
        add = add
    )

}
```

```r
params <- list(a=c(12.0,10.0,0.5,15.0),
               b=c(5.0,2.0,2.5,10.0),
               p=c(0.5,0.5,0.2,0.1),
               lambda=c(2.5,2.5,2.5,2.5),
               col=c("blue","red","black","gray"))

qKwMOE_curve(a = params$a[1],  b = params$b[1], p = params$p[1], lambda = params$lambda[1], col=params$col[1],
qKwMOE_curve(a = params$a[2],  b = params$b[2], p = params$p[2], lambda = params$lambda[2], col=params$col[2],
qKwMOE_curve(a = params$a[3],  b = params$b[3], p = params$p[3], lambda = params$lambda[3], col=params$col[3],
qKwMOE_curve(a = params$a[4],  b = params$b[4], p = params$p[4], lambda = params$lambda[4], col=params$col[4],
legend(
    "topleft",
    legend = c(
        paste0("a = ",params$a[1],",  b = ",params$b[1],"    p = ",params$p[1],", lambda = ",params$lambda[1]),
        paste0("a = ",params$a[2],",  b = ",params$b[2],"    p = ",params$p[2],", lambda = ",params$lambda[2]),
        paste0("a = ",params$a[3],",  b = ",params$b[3],"    p = ",params$p[3],", lambda = ",params$lambda[3]),
        paste0("a = ",params$a[4],",  b = ",params$b[4],"    p = ",params$p[4],", lambda = ",params$lambda[4])
    ),
    lty = 1,
    lwd = 2,
    col = params$col,
)
```




```r
rKwMOE <- function(n, a, b, p, lambda)
{
    U <- runif(n)
    x_q <- (1/lambda)*log( (1 - p*(1-(1-U)^(1/b))^(1/a) ) / (1 - (1-(1-U)^(1/b))^(1/a)) )
    x_q
}
```

```
params <- list(a=c(12.0,10.0,0.5,15.0),
               b=c(5.0,2.0,2.5,10.0),
               p=c(0.5,0.5,0.2,0.1),
               lambda=c(2.5,2.5,2.5,2.5))

rKwMOE(n=10,a = params$a[1],  b = params$b[1], p = params$p[1], lambda = params$lambda[1])
```

```
##  [1] 0.2251478 0.5703248 0.5215132 0.6887865 0.3878635 0.4914752 0.5417415
##  [8] 1.0374144 0.4931869 0.5704314
```

```
rKwMOE(n=10,a = params$a[2],  b = params$b[2], p = params$p[2], lambda = params$lambda[2])
```

```
##  [1] 0.5526452 0.2787452 1.2713657 0.5274659 1.0018385 0.9672524 0.9655029
##  [8] 0.8179552 1.0150983 0.5826127
```

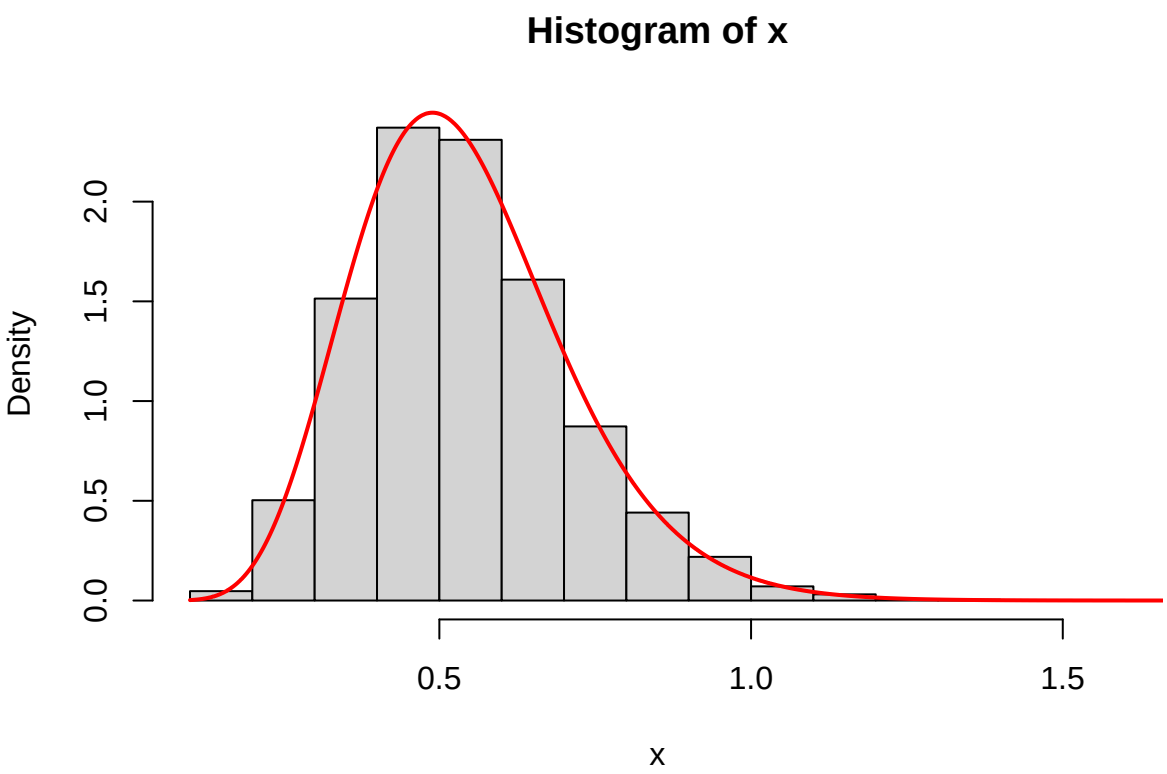
```
rKwMOE(n=10,a = params$a[3],  b = params$b[3], p = params$p[3], lambda = params$lambda[3])
```

```
##  [1] 8.449836e-05 1.618830e-01 6.516792e-02 5.175740e-02 9.727499e-02
##  [6] 4.657831e-02 3.764357e-02 2.807418e-03 1.341203e-02 4.316365e-02
```

```
rKwMOE(n=10,a = params$a[4],  b = params$b[4], p = params$p[4], lambda = params$lambda[4])
```

```
##  [1] 0.8336210 0.5622846 0.9744985 0.5206763 0.9443790 0.7148333 0.8983664
##  [8] 1.0717769 0.7734558 0.6627922
```

```
x <- rKwMOE(
        n = 10000,
        a = params$a[1],
        b = params$b[1],
        p = params$p[1],
        lambda = params$lambda[1]
    )
hist(x, prob = T)
y <- seq(0.1, 100, 0.0001)
lines(
    y,
    dKwMOE(
        y,
        a = params$a[1],
        b = params$b[1],
        p = params$p[1],
        lambda = params$lambda[1]
    ),
    lwd = 2,
    col = "red"
)
```



fazer figuras