Master

A number of viables are defined,

```
n <- 500
x_icount <- 10        # How many x and y there is
x_i <- 1:x_icount
# x_icount <- 10 - 3
# x_i <- c(1:3,rep(2,x_icount))
a_nul <- 0
beta_nul <- 1
gamma_nul <- 0
conff1b <- matrix(nrow=n, ncol=2)
conff1a <- matrix(nrow=n, ncol=2)
limits <- rep(0,n)
errors <- rep(0,n)
betahat <- rep(0,n)
ahat <- rep(0,n)
resulthypotese_ab <- rep(0,n)
bstar <- 1.1
crit = pchisq(0.05,df=2,lower.tail = FALSE)
beta <- function(b,c1 = 1,c2 = 0) {
  b ^ (c1 * x_i + c2)
}
for (ii in 1:n) {
  yi <- rnorm(x_icount, mean=0, sd=1)
  likelihood <- function(a,b) {
    1 / sqrt(2*pi)^x_icount * prod(exp ((- (a * b ^x_i + yi)^2)/2))
  }

  s <- function(b) {
    a <- sum(yi)/sum(beta(b,1,0))
    - sum( a^2 * beta(b,2,-1) * x_i)  +  sum(a * x_i * beta(b,1,-1) * yi)
  }

  i <- function(b) {
    a <- sum(yi)/sum(beta(b,1))
    ma <- sum(a ^ 2 * 2 * (x_i-1) * beta(b,2,-2) * x_i)-sum(a ^ 2 * x_i * (x_i-1) * beta(b,2,-2))
    ma^(-1)
  }

  intim <- function(b, funk1, funk2) {
    score <- funk1
    fish <- funk2
    bk <- b
    itt <-0
    itt1 <- 0
    itt2 <- 0
    while(abs(score(bk) * fish(bk))>0.001) {
      itt<- itt + 1
      bk = bk + fish(bk) * score(bk)
      if (!is.finite(score(bk))==TRUE | !is.finite((fish(bk)))==TRUE) {
        cat("ERROR!", "\n")
```

```
        itt2 <- 1
        break
      }
      if (itt>5000) {
        cat("break", "\n")
        itt1 <- 1
        break(intim)
      }
    }
    c(bk,itt, itt1, itt2)
  }
  resultatintim <- intim(bstar, s, i)
  betahat[ii] <-  resultatintim[1]
  ahat[ii] <- sum(yi)/sum(beta(betahat[ii],1,0))
  lmle <- likelihood(ahat[ii],betahat[ii])

  lognorm <- function(a,b) {
    -2*log(likelihood(a,b)/lmle)
  }

  resulthypotese_ab[ii] <- lognorm(a_nul, beta_nul)<=crit
  j11y <- 1 / (sum(beta(betahat[ii],2,0)))
  j22y <- 1 / (sum(ahat[ii] * (2 * x_i - 1) * beta(betahat[ii],2,-1) * x_i)
               -sum(ahat[ii] * x_i *(x_i - 1)* beta(betahat[ii], 1, 0 ) * yi))
  conff1b[ii,1] <- betahat[ii] - 1.96 * sqrt(abs(j22y))
  conff1b[ii,2] <- betahat[ii] + 1.96 * sqrt(abs(j22y))
  conff1a[ii,1] <- ahat[ii] - 1.96 * sqrt(abs(j11y))
  conff1a[ii,2] <- ahat[ii] + 1.96 * sqrt(abs(j11y))
  limits[ii] <- resultatintim[3]
  errors[ii] <- resultatintim[4]
  cat("Iteration=", ii, "Limits=", sum(limits),  "Errors=",sum(errors) , "\n")
}
```

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## Iteration= 1 Limits= 0 Errors= 0
## break
## Iteration= 2 Limits= 1 Errors= 0
## Iteration= 3 Limits= 1 Errors= 0
## Iteration= 4 Limits= 1 Errors= 0
## Iteration= 5 Limits= 1 Errors= 0
## Iteration= 6 Limits= 1 Errors= 0
## break
## Iteration= 7 Limits= 2 Errors= 0
## Iteration= 8 Limits= 2 Errors= 0
## Iteration= 9 Limits= 2 Errors= 0
## Iteration= 10 Limits= 2 Errors= 0
## Iteration= 11 Limits= 2 Errors= 0
## Iteration= 12 Limits= 2 Errors= 0
## Iteration= 13 Limits= 2 Errors= 0
## Iteration= 14 Limits= 2 Errors= 0
## Iteration= 15 Limits= 2 Errors= 0
## break
## Iteration= 16 Limits= 3 Errors= 0
## ERROR!
## Iteration= 17 Limits= 3 Errors= 1
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## Iteration= 18 Limits= 3 Errors= 1
## ERROR!
## Iteration= 19 Limits= 3 Errors= 2
## break
## Iteration= 20 Limits= 4 Errors= 2
## break
## Iteration= 21 Limits= 5 Errors= 2
## Iteration= 22 Limits= 5 Errors= 2
## Iteration= 23 Limits= 5 Errors= 2
## ERROR!
## Iteration= 24 Limits= 5 Errors= 3
## Iteration= 25 Limits= 5 Errors= 3
## ERROR!
## Iteration= 26 Limits= 5 Errors= 4
## Iteration= 27 Limits= 5 Errors= 4
## Iteration= 28 Limits= 5 Errors= 4
## break
## Iteration= 29 Limits= 6 Errors= 4
## break
## Iteration= 30 Limits= 7 Errors= 4
## ERROR!
## Iteration= 31 Limits= 7 Errors= 5
## Iteration= 32 Limits= 7 Errors= 5
## Iteration= 33 Limits= 7 Errors= 5
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## Iteration= 38 Limits= 7 Errors= 5
## Iteration= 39 Limits= 7 Errors= 5
## break
## Iteration= 40 Limits= 8 Errors= 5
## ERROR!
## Iteration= 41 Limits= 8 Errors= 6
## break
## Iteration= 42 Limits= 9 Errors= 6
## break
## Iteration= 43 Limits= 10 Errors= 6
## ERROR!
## Iteration= 44 Limits= 10 Errors= 7
## break
## Iteration= 45 Limits= 11 Errors= 7
## break
## Iteration= 46 Limits= 12 Errors= 7
## break
## Iteration= 47 Limits= 13 Errors= 7
## Iteration= 48 Limits= 13 Errors= 7
## Iteration= 49 Limits= 13 Errors= 7
## break
## Iteration= 50 Limits= 14 Errors= 7
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## Iteration= 52 Limits= 14 Errors= 7
## Iteration= 53 Limits= 14 Errors= 7
## Iteration= 54 Limits= 14 Errors= 7
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## break
## Iteration= 55 Limits= 15 Errors= 7
## ERROR!
## Iteration= 56 Limits= 15 Errors= 8
## Iteration= 57 Limits= 15 Errors= 8
## Iteration= 58 Limits= 15 Errors= 8
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## Iteration= 61 Limits= 15 Errors= 8
## Iteration= 62 Limits= 15 Errors= 8
## Iteration= 63 Limits= 15 Errors= 8
## ERROR!
## Iteration= 64 Limits= 15 Errors= 9
## break
## Iteration= 65 Limits= 16 Errors= 9
## Iteration= 66 Limits= 16 Errors= 9
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## Iteration= 69 Limits= 16 Errors= 9
## break
## Iteration= 70 Limits= 17 Errors= 9
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## Iteration= 74 Limits= 17 Errors= 9
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## Iteration= 76 Limits= 17 Errors= 9
## break
## Iteration= 77 Limits= 18 Errors= 9
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## break
## Iteration= 79 Limits= 19 Errors= 9
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## Iteration= 83 Limits= 19 Errors= 9
## break
## Iteration= 84 Limits= 20 Errors= 9
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## Iteration= 91 Limits= 20 Errors= 9
## break
## Iteration= 92 Limits= 21 Errors= 9
## break
## Iteration= 93 Limits= 22 Errors= 9
## Iteration= 94 Limits= 22 Errors= 9
## break
## Iteration= 95 Limits= 23 Errors= 9
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## Iteration= 97 Limits= 23 Errors= 9
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## Iteration= 98 Limits= 23 Errors= 9
## ERROR!
## Iteration= 99 Limits= 23 Errors= 10
## break
## Iteration= 100 Limits= 24 Errors= 10
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## Iteration= 102 Limits= 24 Errors= 10
## break
## Iteration= 103 Limits= 25 Errors= 10
## Iteration= 104 Limits= 25 Errors= 10
## Iteration= 105 Limits= 25 Errors= 10
## break
## Iteration= 106 Limits= 26 Errors= 10
## Iteration= 107 Limits= 26 Errors= 10
## Iteration= 108 Limits= 26 Errors= 10
## ERROR!
## Iteration= 109 Limits= 26 Errors= 11
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## break
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## Iteration= 118 Limits= 27 Errors= 11
## break
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## Iteration= 123 Limits= 28 Errors= 11
## Iteration= 124 Limits= 28 Errors= 11
## break
## Iteration= 125 Limits= 29 Errors= 11
## Iteration= 126 Limits= 29 Errors= 11
## ERROR!
## Iteration= 127 Limits= 29 Errors= 12
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## Iteration= 138 Limits= 29 Errors= 12
## Iteration= 139 Limits= 29 Errors= 12
## ERROR!
## Iteration= 140 Limits= 29 Errors= 13
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## Iteration= 142 Limits= 29 Errors= 13
## Iteration= 143 Limits= 29 Errors= 13
## ERROR!
## Iteration= 144 Limits= 29 Errors= 14
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## ERROR!
## Iteration= 147 Limits= 29 Errors= 15
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## Iteration= 159 Limits= 30 Errors= 15
## break
## Iteration= 160 Limits= 31 Errors= 15
## Iteration= 161 Limits= 31 Errors= 15
## break
## Iteration= 162 Limits= 32 Errors= 15
## ERROR!
## Iteration= 163 Limits= 32 Errors= 16
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## break
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## ERROR!
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## ERROR!
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## Iteration= 185 Limits= 35 Errors= 18
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## break
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## ERROR!
## Iteration= 193 Limits= 37 Errors= 19
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## ERROR!
## Iteration= 195 Limits= 37 Errors= 20
## ERROR!
## Iteration= 196 Limits= 37 Errors= 21
## break
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## break
## Iteration= 200 Limits= 39 Errors= 21
## ERROR!
## Iteration= 201 Limits= 39 Errors= 22
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## ERROR!
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## ERROR!
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## break
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## Iteration= 271 Limits= 47 Errors= 28
## Iteration= 272 Limits= 47 Errors= 28
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## break
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## break
## Iteration= 282 Limits= 50 Errors= 28
## ERROR!
## Iteration= 283 Limits= 50 Errors= 29
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## ERROR!
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## break
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## Iteration= 306 Limits= 52 Errors= 30
## ERROR!
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## Iteration= 315 Limits= 54 Errors= 31
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## ERROR!
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## break
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## Iteration= 360 Limits= 59 Errors= 35
## ERROR!
## Iteration= 361 Limits= 59 Errors= 36
## Iteration= 362 Limits= 59 Errors= 36
## break
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## break
## Iteration= 370 Limits= 61 Errors= 36
## break
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## Iteration= 384 Limits= 64 Errors= 36
## ERROR!
## Iteration= 385 Limits= 64 Errors= 37
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## break
## Iteration= 399 Limits= 68 Errors= 37
## break
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## break
## Iteration= 402 Limits= 70 Errors= 37
## Iteration= 403 Limits= 70 Errors= 37
## Iteration= 404 Limits= 70 Errors= 37
## ERROR!
## Iteration= 405 Limits= 70 Errors= 38
## ERROR!
## Iteration= 406 Limits= 70 Errors= 39
## Iteration= 407 Limits= 70 Errors= 39
## Iteration= 408 Limits= 70 Errors= 39
## ERROR!
## Iteration= 409 Limits= 70 Errors= 40
## break
## Iteration= 410 Limits= 71 Errors= 40
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## Iteration= 412 Limits= 71 Errors= 40
## Iteration= 413 Limits= 71 Errors= 40
## Iteration= 414 Limits= 71 Errors= 40
## ERROR!
## Iteration= 415 Limits= 71 Errors= 41
## Iteration= 416 Limits= 71 Errors= 41
## break
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## break
## Iteration= 426 Limits= 74 Errors= 41
## Iteration= 427 Limits= 74 Errors= 41
## Iteration= 428 Limits= 74 Errors= 41
## Iteration= 429 Limits= 74 Errors= 41
## break
## Iteration= 430 Limits= 75 Errors= 41
## break
## Iteration= 431 Limits= 76 Errors= 41
## break
## Iteration= 432 Limits= 77 Errors= 41
## Iteration= 433 Limits= 77 Errors= 41
## ERROR!
## Iteration= 434 Limits= 77 Errors= 42
## Iteration= 435 Limits= 77 Errors= 42
## ERROR!
## Iteration= 436 Limits= 77 Errors= 43
## ERROR!
## Iteration= 437 Limits= 77 Errors= 44
## ERROR!
## Iteration= 438 Limits= 77 Errors= 45
## Iteration= 439 Limits= 77 Errors= 45
```

```
## Iteration= 440 Limits= 77 Errors= 45
## ERROR!
## Iteration= 441 Limits= 77 Errors= 46
## ERROR!
## Iteration= 442 Limits= 77 Errors= 47
## Iteration= 443 Limits= 77 Errors= 47
## Iteration= 444 Limits= 77 Errors= 47
## Iteration= 445 Limits= 77 Errors= 47
## Iteration= 446 Limits= 77 Errors= 47
## break
## Iteration= 447 Limits= 78 Errors= 47
## Iteration= 448 Limits= 78 Errors= 47
## Iteration= 449 Limits= 78 Errors= 47
## Iteration= 450 Limits= 78 Errors= 47
## ERROR!
## Iteration= 451 Limits= 78 Errors= 48
## Iteration= 452 Limits= 78 Errors= 48
## Iteration= 453 Limits= 78 Errors= 48
## Iteration= 454 Limits= 78 Errors= 48
## Iteration= 455 Limits= 78 Errors= 48
## Iteration= 456 Limits= 78 Errors= 48
## Iteration= 457 Limits= 78 Errors= 48
## break
## Iteration= 458 Limits= 79 Errors= 48
## break
## Iteration= 459 Limits= 80 Errors= 48
## Iteration= 460 Limits= 80 Errors= 48
## Iteration= 461 Limits= 80 Errors= 48
## ERROR!
## Iteration= 462 Limits= 80 Errors= 49
## Iteration= 463 Limits= 80 Errors= 49
## Iteration= 464 Limits= 80 Errors= 49
## Iteration= 465 Limits= 80 Errors= 49
## Iteration= 466 Limits= 80 Errors= 49
## Iteration= 467 Limits= 80 Errors= 49
## Iteration= 468 Limits= 80 Errors= 49
## Iteration= 469 Limits= 80 Errors= 49
## Iteration= 470 Limits= 80 Errors= 49
## Iteration= 471 Limits= 80 Errors= 49
## Iteration= 472 Limits= 80 Errors= 49
## Iteration= 473 Limits= 80 Errors= 49
## break
## Iteration= 474 Limits= 81 Errors= 49
## Iteration= 475 Limits= 81 Errors= 49
## break
## Iteration= 476 Limits= 82 Errors= 49
## break
## Iteration= 477 Limits= 83 Errors= 49
## Iteration= 478 Limits= 83 Errors= 49
## Iteration= 479 Limits= 83 Errors= 49
## Iteration= 480 Limits= 83 Errors= 49
## Iteration= 481 Limits= 83 Errors= 49
## ERROR!
## Iteration= 482 Limits= 83 Errors= 50
```

```
## Iteration= 483 Limits= 83 Errors= 50
## Iteration= 484 Limits= 83 Errors= 50
## Iteration= 485 Limits= 83 Errors= 50
## Iteration= 486 Limits= 83 Errors= 50
## Iteration= 487 Limits= 83 Errors= 50
## Iteration= 488 Limits= 83 Errors= 50
## Iteration= 489 Limits= 83 Errors= 50
## Iteration= 490 Limits= 83 Errors= 50
## break
## Iteration= 491 Limits= 84 Errors= 50
## Iteration= 492 Limits= 84 Errors= 50
## Iteration= 493 Limits= 84 Errors= 50
## Iteration= 494 Limits= 84 Errors= 50
## break
## Iteration= 495 Limits= 85 Errors= 50
## Iteration= 496 Limits= 85 Errors= 50
## break
## Iteration= 497 Limits= 86 Errors= 50
## Iteration= 498 Limits= 86 Errors= 50
## break
## Iteration= 499 Limits= 87 Errors= 50
## Iteration= 500 Limits= 87 Errors= 50
```

```
cat("How many times did alpha0 end inside the confidence interval", "\n")
```

```
## How many times did alpha0 end inside the confidence interval
```

```
confresula <- which(conff1a[,1] < a_nul & conff1a[,2] > a_nul)
length(confresula)
```

```
## [1] 388
```

```
cat("How many times did beta0 end inside the confidence interval", "\n")
```

```
## How many times did beta0 end inside the confidence interval
```

```
confresulb <- which(conff1b[,1] < beta_nul & conff1b[,2] > beta_nul)
length(confresulb)
```

```
## [1] 240
```

```
cat("How many was m2lognorm less or equal to the critical values", "\n")
```

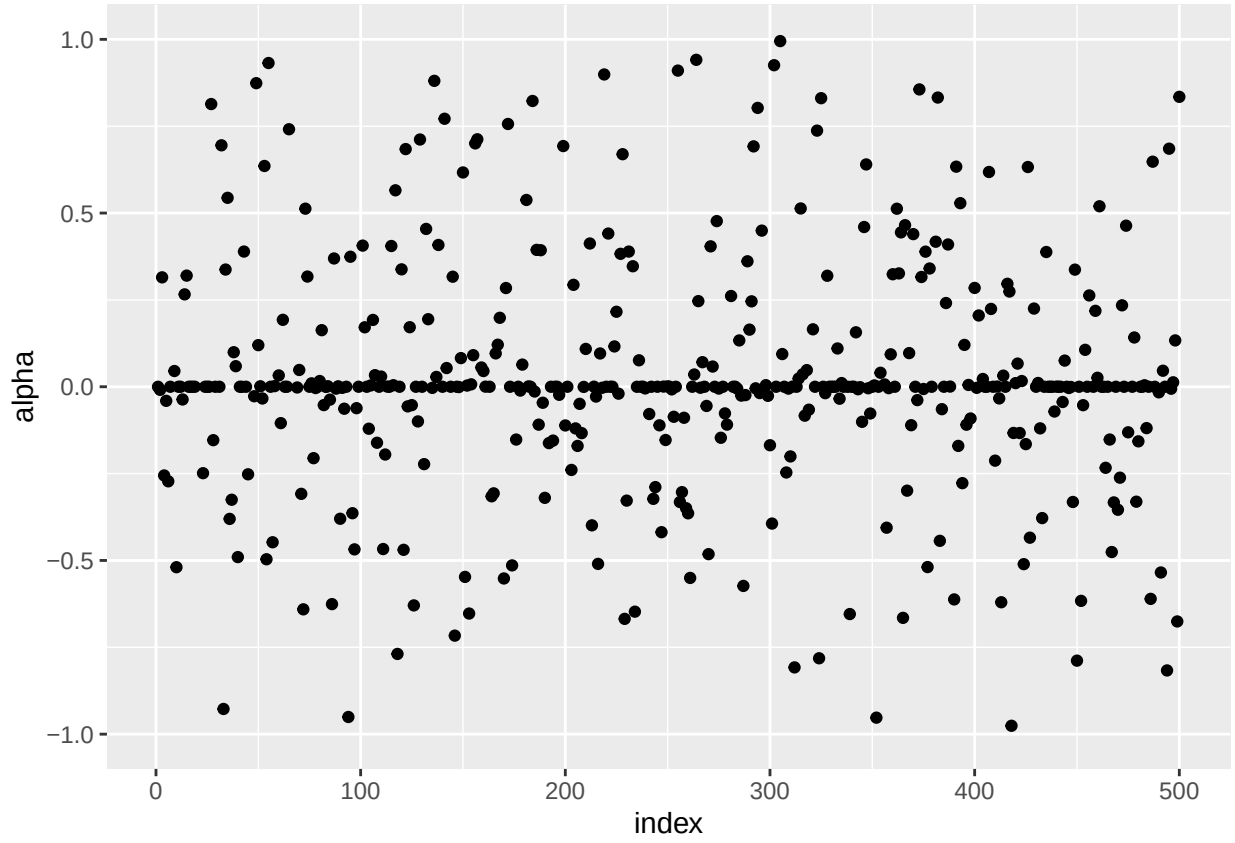
```
## How many was m2lognorm less or equal to the critical values
```

```
sum(resulthypotese_ab)
```

```
## [1] 498
```

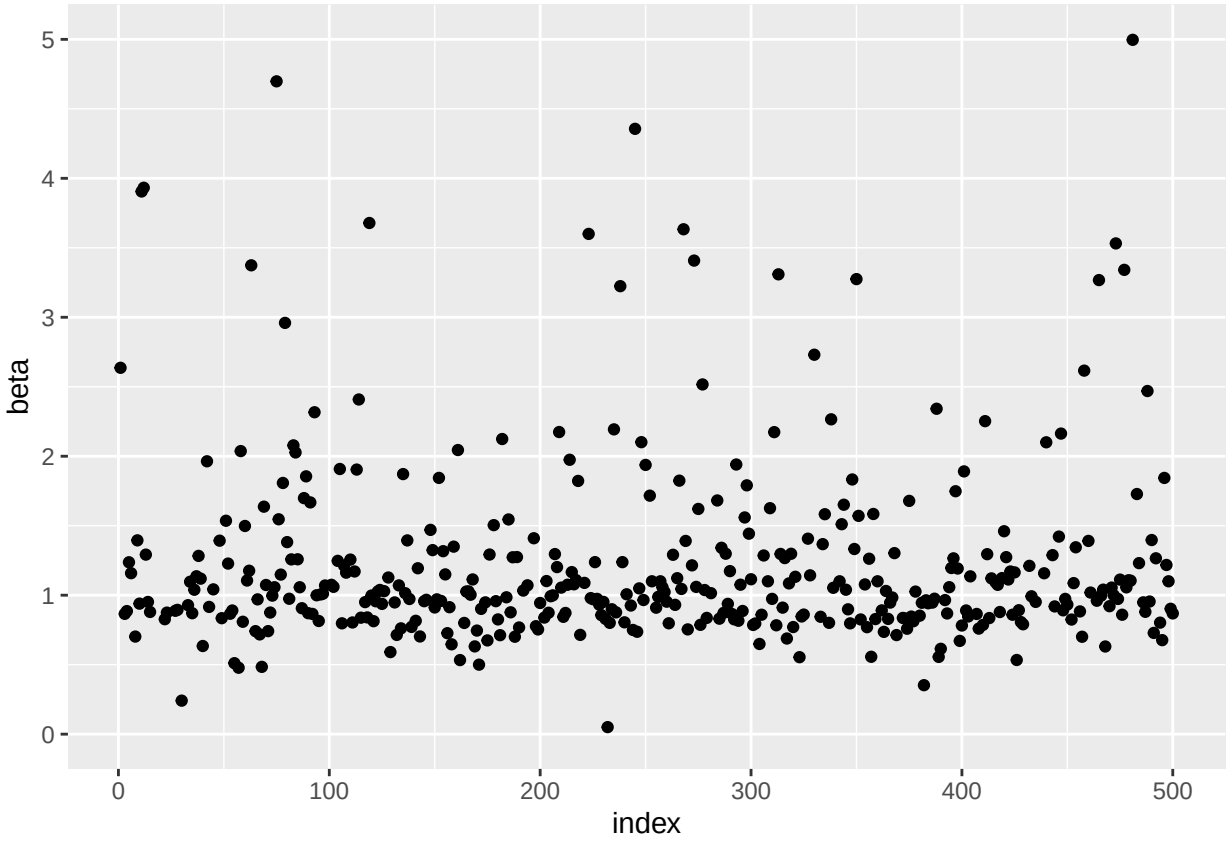
```
ahat_plot <- data.frame(x=1:n, y= ahat)
betahat_plot <- data.frame(x=1:n, y= betahat)
ahat_betahat <- data.frame(x= ahat, y=betahat)
ggplot(ahat_plot, aes(x,y)) +
  geom_point() +
  scale_y_continuous(limits=c(-1,1)) +
  labs(x = "index", y= "alpha")
```

```
## Warning: Removed 39 rows containing missing values (geom_point).
```



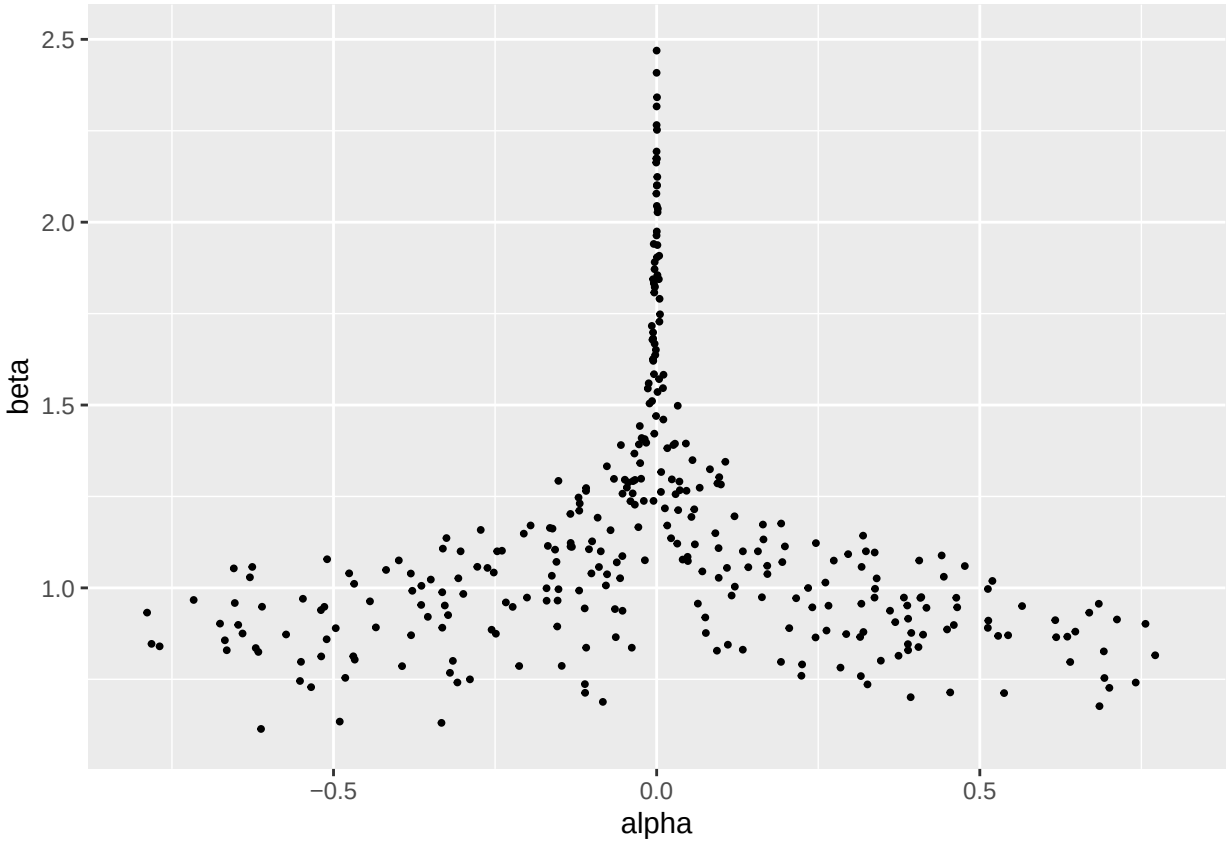

```
ggplot(betahat_plot, aes(x,y)) +
  geom_point() +
  scale_y_continuous(limits=c(0,5)) +
  labs(x = "index", y= "beta")
```

```
## Warning: Removed 91 rows containing missing values (geom_point).
```




```
ggplot(ahat_betahat, aes(x,y)) +
  geom_point(size = 0.7) +
  scale_y_continuous(limits=c(0.6,2.5)) +
  scale_x_continuous(limits=c(-0.8,0.8)) +
  labs(x = "alpha", y= "beta")
```

```
## Warning: Removed 171 rows containing missing values (geom_point).
```




```
x_icount <- 20
n <- 1
x_i <- 1:x_icount
beta_nul <- 1
gamma_nul <-0
p_waldtest_g <- rep(0,n)
conff1g <- matrix(nrow=1, ncol=2)
betahat <- rep(0,n)
ahat <- rep(0,n)
gammahat <- rep(0,n)
resulthypotese <- rep(0,n)
bstar <- 1.1
crit = pchisq(0.05,df=3,lower.tail = FALSE)
beta <- function(b,c1 = 1,c2 = 0) {
  b ^ (c1 * x_i + c2)
}

yi <- c(-0.8, 1.15, 1.82, 2.89, 1.43, 0.59, 1.09, 3.00, 2.81, 3.02, 2.39, 3.50, 3.06, 2.41, 2.81, 3.95,
likelihood <- function(a,b,g) {
  1 / sqrt(2*pi)^x_icount * prod(exp(( - (a * b ^x_i -yi + g)^2)/2))
  }

  s <- function(b) {
    a_s <- sum(beta(b))
    b_s <- (sum(beta(b))) / n * sum(beta(b))
    c_s <- (sum(beta(b))) / n * sum(yi)
```

```
  d_s <- sum(yi*beta(b))
  sahat <- (c_s-d_s)/(b_s-a_s)
  gamma <- 1 / n * sum(sahat*beta(b)-yi)
  - sum((sahat * beta(b) + gamma - yi ) * beta(b,1,-1) * x_i* sahat)
}

i <- function(b) {
  a_s <- sum(beta(b))
  b_s <- (sum(beta(b))) / n * sum(beta(b))
  c_s <- (sum(beta(b))) / n * sum(yi)
  d_s <- sum(yi*beta(b))
  sahat <- (c_s-d_s)/(b_s-a_s)
  gamma <- 1 / n * sum(sahat*beta(b))- sum(yi)
  imi <- sum(x_i * sahat * beta(b,1,-2) * ((2*x_i-1) * sahat *beta(b) +
            gamma * (x_i-1) - ((sahat * beta(b) + gamma)) *(x_i -1)  ))
  imi^-1
}

intim <- function(b, funk1, funk2) {
  score <- funk1
  fish <- funk2
  bk <- b
  itt <-0
  itt1 <- 0
  itt2 <- 0
  while(abs(score(bk) * fish(bk))>0.001) {
    itt<- itt + 1
    bk = bk + fish(bk) * score(bk)
    if (!is.finite(score(bk))==TRUE | !is.finite((fish(bk)))==TRUE) {
      cat("ERROR!", "\n")
      itt2 <- 1
      break
    }
    if (itt>5000) {
      cat("break", "\n")
      itt1 <- 1
      break(intim)
    }
  }
  c(bk,itt, itt1, itt2)
}
resultatintim <- intim(bstar, s, i)
betahat <-  resultatintim[1]
ahat_s <- sum(beta(betahat))
bhat_s <- (sum(beta(betahat))) / n * sum(beta(betahat))
chat_s <- (sum(beta(betahat))) / n * sum(yi)
dhat_s <- sum(yi*beta(betahat))
ahat <- (chat_s-dhat_s)/(bhat_s-ahat_s)
gammahat <- 1 / n * sum(ahat*beta(betahat))- sum(yi)
lmle <- likelihood(ahat,betahat, gammahat)
lognorm <- function(a,b,g) {
  -2*log(likelihood(a,b,g)/lmle)
}
```

```
  resulthypotese <- lognorm(ahat, betahat, gamma_nul)<=crit
  j33y <- 1 / x_icount
  waldtestg <- (gammahat-gamma_nul)^2/ j33y
  p_waldtest_g <- 2*pnorm(abs(waldtestg), lower.tail = FALSE)

  conff1g[,1] <- gammahat - 1.96 * sqrt(abs(j33y))
  conff1g[,2] <- gammahat + 1.96 * sqrt(abs(j33y))
cat("Was gamma0 inside the confidence interval", "\n")
```

```
## Was gamma0 inside the confidence interval
```

```
confresulg <- which(conff1g[,1] < gamma_nul & conff1g[,2] > gamma_nul)
length(confresulg)
```

```
## [1] 0
```

```
cat("Did gamma0 pass the waldtest?", "\n")
```

```
## Did gamma0 pass the waldtest?
```

```
p_waldtest_g>=0.05
```

```
## [1] FALSE
```

```
cat("Was n2lognorm less than the critical value?", "\n")
```

```
## Was n2lognorm less than the critical value?
```

```
sum(resulthypotese)
```

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

```
Param_NR <- c(ahat*betahat^x_i+gammahat)
```

```
likelihood_v <- function(abg) {
      1 / sqrt(2*pi)^x_icount * prod(exp((- (abg[1] * abg[2]^x_i +abg[3]  -yi)^2)/2))
  }
param_optim <- optim(c(0,1,0), likelihood_v)$par
lmle_optim <- likelihood(param_optim[1],param_optim[2], param_optim[3])

lognorm_optim <- function(a,b,g) {
  -2*log(likelihood(a,b,g)/lmle_optim)
  }

resulthypotese_optim <- lognorm_optim(param_optim[1], param_optim[2], gamma_nul)<=crit
waldtestg_optim <- (param_optim[3]-gamma_nul)^2/ j33y
p_waldtest_g_optim <- 2*pnorm(abs(waldtestg_optim), lower.tail = FALSE)
conff1g_optim <- matrix(nrow=1, ncol=2)
conff1g_optim[,1] <- param_optim[3] - 1.96 * sqrt(abs(j33y))
conff1g_optim[,2] <- param_optim[3] + 1.96 * sqrt(abs(j33y))
cat("Was gamma0 inside the confidence interval", "\n")
```

```
## Was gamma0 inside the confidence interval
```

```
confresulg_optim <- which(conff1g_optim[,1] < gamma_nul & conff1g_optim[,2] > gamma_nul)
length(confresulg_optim)
```

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

```r
cat("Did gamma0 pass the waldtest?", "\n")
```

```
## Did gamma0 pass the waldtest?
```

```r
p_waldtest_g_optim>=0.05
```

```
## [1] TRUE
```

```r
cat("Was n2lognorm less than the critical value?", "\n")
```

```
## Was n2lognorm less than the critical value?
```

```r
sum(resulthypotese_optim)
```

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

```r
x_icount <- 20
n <- 1
x_i <- 1:20
a_nul <- 0
beta_nul <- 1
p_waldtest_b <- rep(0,n)
conff1b <- matrix(nrow=n, ncol=2)
betahat <- rep(0,n)
ahat <- rep(0,n)
bstar <- 2
resulthypotese <- rep(0,n)
crit = pchisq(0.05,df=2,lower.tail = FALSE)
beta <- function(b,c1,c2 = 0) {
  b ^ (c1 * x_i + c2)
}

  yi <- c(-0.8, 1.15, 1.82, 2.89, 1.43, 0.59, 1.09, 3.00, 2.81, 3.02, 2.39, 3.50, 3.06, 2.41, 2.81, 3.95
  likelihood <- function(a,b) {
     1 / sqrt(2*pi)^x_icount * prod(exp((- (a * b ^x_i -yi)^2)/2))
  }

  s <- function(b) {
    a <- sum(yi)/sum(beta(b,1,0))
    - sum( a^2 * beta(b,2,-1) * x_i)  +  sum(a * x_i * beta(b,1,-1) * yi)
  }

  i <- function(b) {
    a <- sum(yi)/sum(beta(b,1))
    ma <- sum(a ^ 2 * 2 * (x_i-1) * beta(b,2,-2) * x_i)-sum(a ^ 2 * x_i * (x_i-1) * beta(b,2,-2))
    ma^(-1)
  }

  intim <- function(b, funk1, funk2) {
    score <- funk1
    fish <- funk2
    bk <- b
    itt <-0
    itt1 <- 0
    itt2 <- 0
    while(abs(score(bk) * fish(bk))>0.001) {
```

```
      itt<- itt + 1
      bk = bk + fish(bk) * score(bk)
      if (!is.finite(score(bk))==TRUE | !is.finite((fish(bk)))==TRUE) {
        cat("ERROR!", "\n")
        itt2 <- 1
        break
      }
      if (itt>5000) {
        cat("break", "\n")
        itt1 <- 1
        break(intim)
      }
    }
    c(bk,itt, itt1, itt2)
  }
  resultatintim <- intim(bstar, s, i)
  betahat <-  resultatintim[1]
  ahat <- sum(yi)/sum(beta(betahat,1,0))
  lmle <- likelihood(ahat,betahat)

  lognorm <- function(a,b) {
    -2*log(likelihood(a,b)/lmle)
  }

  resulthypotese <- lognorm(ahat, beta_nul)<=crit #Alpha afhænger af beta, beta_nul indsættes
  j22y <- 1 / (sum(ahat * (2 * x_i - 1) * beta(betahat,2,-1) * x_i) -
                 sum(ahat * x_i *(x_i - 1)* beta(betahat, 1, 0 ) * yi))
  waldtestb <- (betahat-beta_nul) ^ 2 / j22y
  p_waldtest_b <- 2*pnorm(abs(waldtestb), lower.tail = FALSE)
  conff1b[,1] <- betahat - 1.96 * sqrt(abs(j22y))
  conff1b[,2] <- betahat + 1.96 * sqrt(abs(j22y))
cat("Was beta0 inside the confidence interval", "\n")
```

```
## Was beta0 inside the confidence interval
```

```
confresulb <- which(conff1b[,1] < beta_nul & conff1b[,2] > beta_nul)
length(confresulb)
```

```
## [1] 0
```

```
cat("Did beta0 pass the waldtest?", "\n")
```

```
## Did beta0 pass the waldtest?
```

```
p_waldtest_b>=0.05
```

```
## [1] FALSE
```

```
cat("Was n2lognorm less than the critical value?", "\n")
```

```
## Was n2lognorm less than the critical value?
```

```
sum(resulthypotese)
```

```
## [1] 0
```

```
likelihood_v <- function(ab) {
     1 / sqrt(2*pi)^x_icount * prod(exp((- (ab[1] * ab[2]^x_i -yi)^2)/2))
```

```
  }
param_optim <- optim(c(0.5,2), likelihood_v)$par
lmle_optim <- likelihood(param_optim[1],param_optim[2])

lognorm_optim <- function(ab) {
  -2*log(likelihood_v(ab)/lmle_optim)
  }



resulthypotese_optim <- lognorm_optim(c(param_optim[1], beta_nul))<=crit
j22y <- 1 / (sum(param_optim[1] * (2 * x_i - 1) * beta(param_optim[2],2,-1) * x_i) -
                sum(param_optim[1] * x_i *(x_i - 1)* beta(param_optim[2], 1, 0 ) * yi))
waldtestb_optim <- (param_optim[2]-beta_nul)^2/ j22y
p_waldtest_b_optim <- 2*pnorm(abs(waldtestb_optim), lower.tail = FALSE)
conff1b_optim <- matrix(nrow=1, ncol=2)
conff1b_optim[,1] <- param_optim[2] - 1.96 * sqrt(abs(j22y))
conff1b_optim[,2] <- param_optim[2] + 1.96 * sqrt(abs(j22y))
cat("Was beta0 inside the confidence interval", "\n")
```

```
## Was beta0 inside the confidence interval
```

```
confresulb_optim <- which(conff1b_optim[,1] < beta_nul & conff1b_optim[,2] > beta_nul)
length(confresulb_optim)
```

```
## [1] 0
```

```
cat("Did beta0 pass the waldtest?", "\n")
```

```
## Did beta0 pass the waldtest?
```

```
p_waldtest_b_optim>=0.05
```

```
## [1] FALSE
```

```
cat("Was n2lognorm less than the critical value?", "\n")
```

```
## Was n2lognorm less than the critical value?
```

```
sum(resulthypotese_optim)
```

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