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Analysis of Environmental Data

Lab 5

October 17, 2021

Worked with Juliana Berube

1: Show the R code you used to create exp\_fun()

require(here)

dat = read.csv(here("data", "dispersal.csv"))

exp\_fun = function(x, a, b)

{

return(a \* exp(-b\*x))

}

plot(dat$disp.rate.ftb, dat$dist.class)

curve(

exp\_fun(x, 1700, 5), add = TRUE, from = 0, to = 1,

ann = FALSE, axes = TRUE, ylab = "f(x)"); box()

2: In your lab report, include a single figure containing four negative exponential curves with these parameter values:

Chart

Description automatically generated with medium confidence

3: Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter a

When x = 0, a = y. This is the “beginning” of the exponential curve. When a was changed from 1.9 to 1.2, the “beginning” of the curve started lower on the y-axis.

4: Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter b

B is the “steepness” or how straight or curved the exponential curve is. The larger the b, the more dip in the curve.

5: In your lab report, include a single plot containing 6 Ricker curves with these parameter values:

Chart

Description automatically generated

6: Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter a

a determines the height of the tip of the curve. If the a is raised when the b is consistent, the curve is steeper and reaches a higher maximum y-value (on the left side of the curve).

Chart, line chart

Description automatically generated

7: Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter b

B determines where on the x-axis the tip of the curve is. The larger the b-value, the lower the x-value where the peak of the curve is.

Chart, line chart

Description automatically generated

Q8 (2 pts): Linear Model. Provide the values of the slope, x1 and y1 parameters you chose. Briefly describe how you chose the values.

X = 700

Y = 0.2

Slope = -0.0002

I chose x and y based on the location that I thought the line would run through (700 , 0.2). After that I knew the slope had to be negative and represent rise/run. I played around with different slopes until I felt the linear model was a good visual representation.

Q9 (2 pts): In your lab report, include a scatterplot of the salamander data with your fitted linear model.

Chart, scatter chart

Description automatically generated

Q10 (2 pts): Exponential Model. Provide the values of the a and b. Briefly describe how you chose the values.

A = 1

B = 0.002

I initially started out with finding my b-value. I thought a good place for the curve to change directions was around x = 500. To find my b, I did 1/500 = 0.002. A is the beginning of the curve (where x and y intercept on the plot). I wanted the start of the curve to be at 1.

Q11 (2 pts): In your lab report, include a scatterplot of the salamander data with your fitted exponential model.

Chart

Description automatically generated

Q12 (2 pts): Ricker Model Provide the values of the a and b. Briefly describe how you chose the values.

A= 0.0055

B= (1/350)

I again started with the b-value. I chose what x-value I wanted the peak of the curve to be. I chose x = 350, so my b would be (1/350). Then I chose what y-value I wanted the peak of the curve to be. I chose y = 0.7. Then I rearranged the ricker formula to get a = (0.7 \* (1/350)) / e-1

. That is equal to a = 0.0054 (I made a = 0.0055 because its prettier).

Q13 (2 pts): In your lab report, include a scatterplot of the salamander data with your fitted ricker model.

Chart, scatter chart

Description automatically generated

Q14 (4 pts): Show the R code you used to create your data frame of model residuals.

pred\_linear = line\_point\_slope(dat$dist.class, 700, .2, -0.0002)

resids\_linear = (pred\_linear - dat$disp.rate.ftb)

pred\_exp = exp\_fun(dat$dist.class, 1, .002)

resids\_exp = (pred\_exp - dat$disp.rate.ftb)

pred\_ricker = ricker\_fun(dat$dist.class, .0055, (1/350))

resids\_ricker = (pred\_ricker - dat$disp.rate.ftb)

dat$resids\_linear <- resids\_linear

dat$resids\_exp <- resids\_exp

dat$resids\_ricker <- resids\_ricker

Q15 (3 pts.): In your lab report, include histograms of the residuals for each of your three models. You may create a single figure with three panels, or include three separate figures.

Diagram, histogram

Description automatically generated