Avian Species Richness in the United States

Your Name

Today's Date

1 Introduction

We want to know whether avian species richness (the number of birds per state) is correlated with the size of the state, the average annual temperature, or the mean annual precipitation.

2 Methods

To examine the relationship between avian species richness and the covariates area, temperature, and precipitation, we used the following multiple linear regression model:

$$y_i = \beta_0 + \beta_1 x_{i,1} + \beta_2 x_{i,2} + \beta_3 x_{i,3} + \epsilon_i,$$
$$\epsilon_i \sim \text{Normal}(0, \sigma^2),$$

where y_i represents the number of species for the $i = 1, \ldots, n$ state, $x_{i,1}$ represents the area of the i^{th} state, $x_{i,2}$ represents the mean annual temperature of the i^{th} state, and $x_{i,3}$ represents the mean annual precipitation of the i^{th} state. To estimate model parameters, we used `R` statistical software. The `R` script is shown, below.

3 Results

3.1 Parameter Estimates

The estimated intercept of our model, β_0, was 184. Thus, the expected number of species for a state with area equal to zero, temperature equal to zero, and precipitation equal to zero was 184. The estimated regression parameter for area, β_1, was 0.0000385. Thus, as area increased by one km^2, the expected number of speciesincresed by 0.0000385. The estimated regression parameter for temperature, β_2, was 4.10. As temperature increased by one degree Farenheit, the expected number of species incresed by 4.10. The estimated regression parameter for precipitation, β_3, was -2.45. As temperature increased by one degree Farenheit, the expected number of species decresed by 2.45.

Our fitted model is:

$$y_i = 184 + 0.0000385 x_{i,1} + 410 x_{i,2} - 2.45 x_{i,3} + \epsilon_i,$$
$$\epsilon_i \sim \text{Normal}(0, 46^2),$$

3.2 Figures

To see the marginal relationship between y_i and: $x_{i,1}$, $x_{i,2}$, and $x_{i,3}$, see Fig. 1

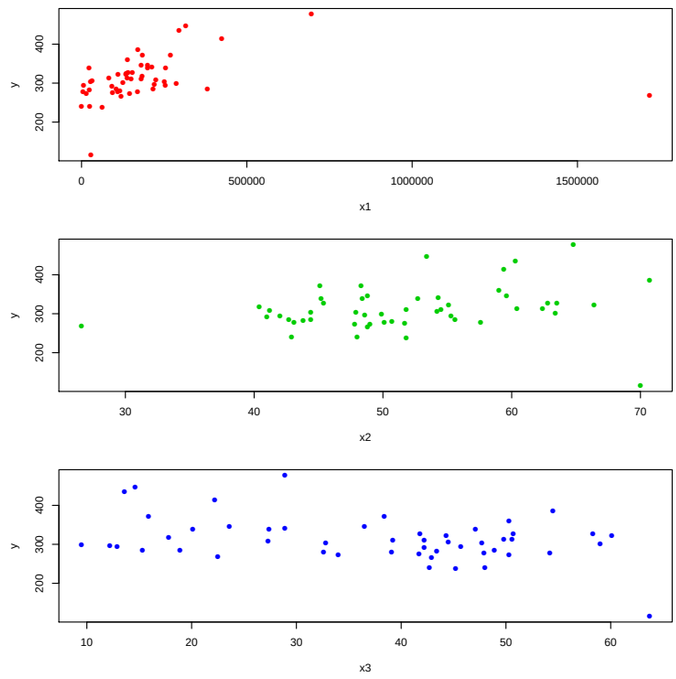

Figure 1: Marginal plot of the relationship between response variable and predictor variables.

3.3 Tables

To see the parameter estimates and associated standard errors see Table 1.

Table 1: Parameter estimates and SE of parameters from our fitted model.

Parameter	Estimate	SE
β_0	184	43.6
β_1	0.0000385	0.0000289
β_2	410	0.889
β_3	-2.45	0.552
σ^2	46	-

4 Discussion

After reconsidering, Alaska seems like an outlier. Re-fit the model by removing Alaska from the data (for an example of how to do this, see the commented code on line 34 of the "MainAnalysis.R" file. Update your manuscript accordingly.