Final 6

Time to Second Birth.

(a) Using WinBUGS establish a regression model with variables mage and death as covariates. What is the 95% CS for the slope β_2 corresponding to variable death? Is this variable significant?

The 95% CS for slope2 β_2 is (-216.7, -124.6). Since the CS does not contains 0, it suggests that this variable is significant.

(b) By analyzing β_1, the coefficient of covariate mage, argue that age of mother is not significant factor in influencing the response time.

The 95% CS for slope2 β_1 is (-3.036, 0.7651). Since the CS does contains 0, it suggests that this variable is not significant.

(c) Helga is a mother with two children. The children are healthy and growing. Helga was 24 when her first child was born. What is the predicted time between the births according to your model. The predicted time between the birth is 982.5 days.

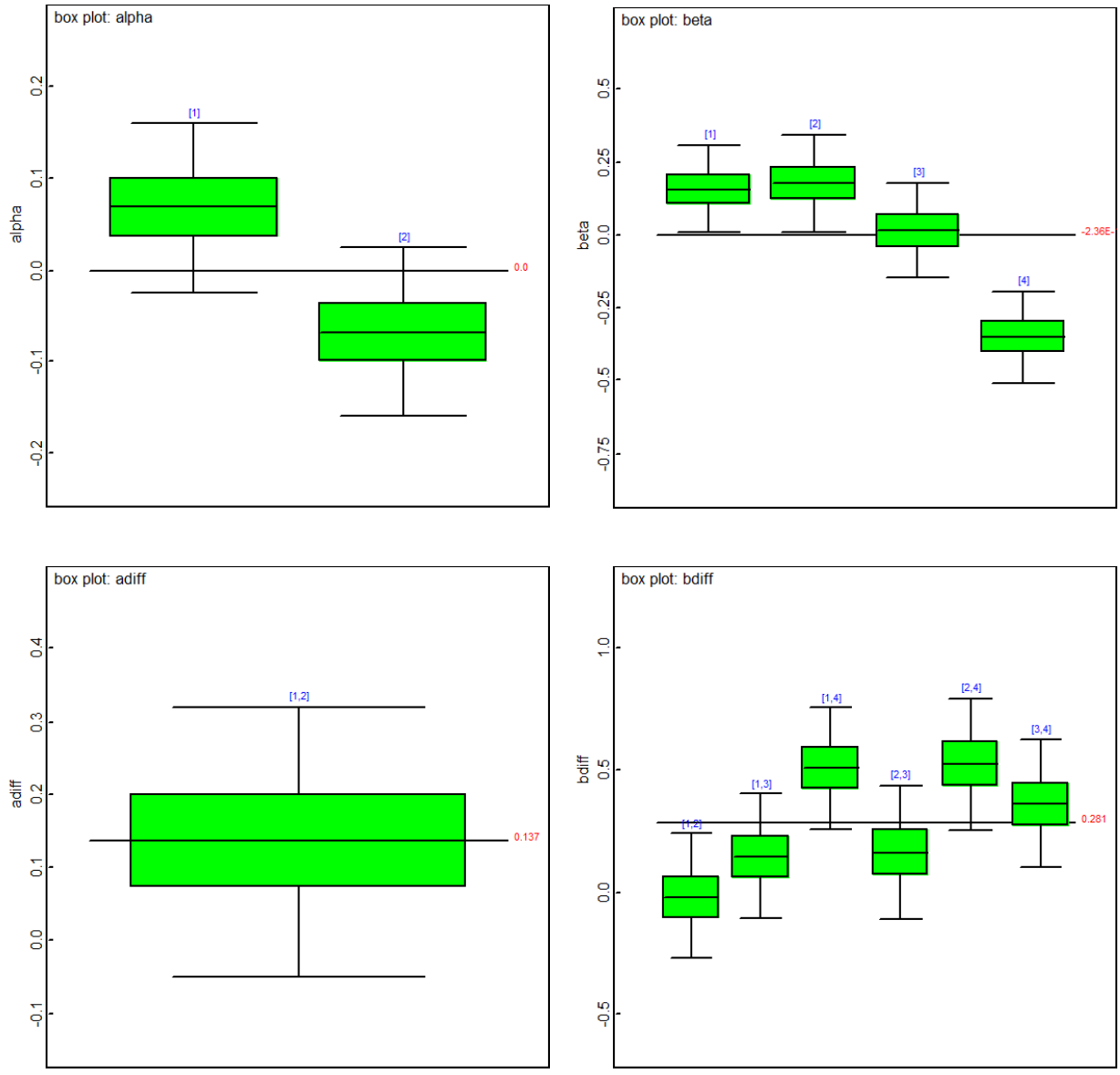
(d) Emma lost her firstborn child at its birth when she was 28. She gave a birth to the second child. What is the 95% CS for the predicted time between the births according to your model.

The 95% CS for the predicted time between the births is (-40.26, 1627.0)

Tasmanian Clouds

(a) Provide a comprehensive Bayesian additive two-way ANOVA analysis on the response DIFF to estimate and test the effects of factors Season and Seeded.

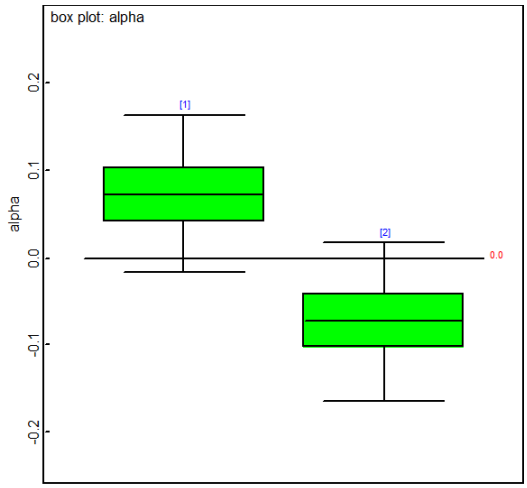
From the box plots below and statistics, we can see that Seeded has no significant effect on DIFF, because the 95% CS of adiff[1,2] contains 0. For Season, we can see that it has significant effect on DIFF, since the 95% of bdiff[1,4], bdiff[2,4] and bdiff[3,4] all do not contain 0. It means that the effect of winter is different from the effect of spring, summer and autumn.

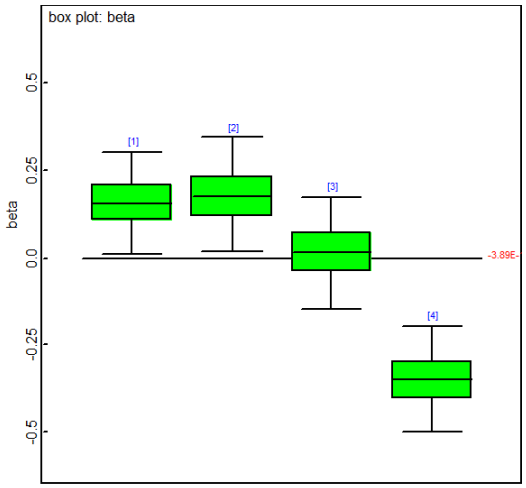


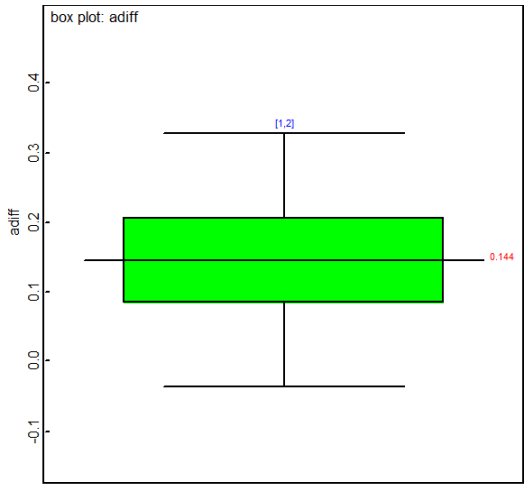
(b) Repeat the analysis from (a) after adding the interaction term.

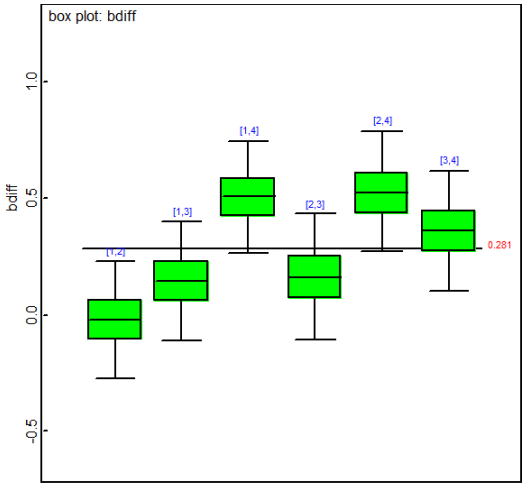
From the box plots and statistics, we can see that only alpha.beta[1,3] and alpha.beta[2,3] do not contain 0 in their 95% CS. It means that those interaction significantly affect DIFF. For Seeded, we can see that Seeded has no significant effect on DIFF, because the 95% CS of adiff[1,2] contains 0. For Season, we can see that it has significant effect on DIFF, since the 95% of bdiff[1,4], bdiff[2,4] and bdiff[3,4] all do not contain 0. It means that the effect of winter is different from the effect of spring, summer and autumn.

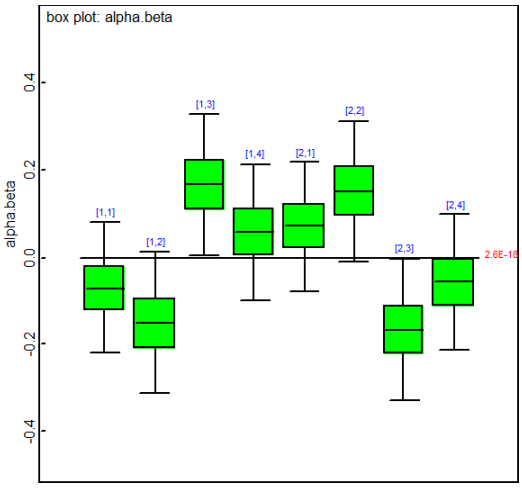
Final 6


box plot: alpha
alpha
0.2
0.1
0.0
-0.1
-0.2
[1]
[2]
0.0


box plot: beta
beta
0.5
0.25
0.0
-0.25
-0.5
[1]
[2]
[3]
[4]
-3.89E-


box plot: adiff
adiff
0.4
0.3
0.2
0.1
0.0
-0.1
[1,2]
0.144


box plot: bdiff
bdiff
1.0
0.5
0.0
-0.5
[1,2]
[1,3]
[1,4]
[2,3]
[2,4]
[3,4]
0.281


box plot: alpha.beta
alpha.beta
0.4
0.2
0.0
-0.2
-0.4
[1,1]
[1,2]
[1,3]
[1,4]
[2,1]
[2,2]
[2,3]
[2,4]
2.6E-18

Final 6

Miller Lumber Company Customer Survey

(a) Propose Poisson model with customers as response variable and hunits, aveinc, aveage, distcomp, and diststore, as covariates. Use noninformative priors on regression coecients.

The poisson model is:

customers $= \exp\{2.801 + 0.5811 * \frac{hunits}{1000} - 0.1075 * \frac{aveinc}{10000} - 0.003381 * avehage + 0.1784 * distcomp - 0.1186 * diststore\}$

(b) If you are to propose a Poisson model with only two covariates which two you will chose? Justify your choice.

Build all possible models with only two covariates, then judge the performance of the model by their deviance. The lower the better. It turns out that the combination of **distcomp** and **diststore** is the best. The deviance of the model is 595.8.

(c) Miller Lumber Company is opening a new store in an area for which the covariates are hunits=720, aveinc=70000, aveage=6, distcomp=4.1, and diststore=8. Find mean response and prediction with 95% for number of customers in a representative 2-week period.

The mean response is 9.307, the 95% CS is [4, 16].