Advanced Methods in Applied Statistics
Problem set 1

Philip Kofoed-Djursner
(Tkv976)

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1 Main exercises

1.1 Exercise 1

The Pomeroy College Basketball Ratings is a set of datasets of ranking, win/lose record, and various ratings of different college basketball teams, which is created each year. Furthermore, the teams are also divided into conferences. I pulled the data of the 2014 ratings from kenpom.com on the 9th of February 2023. The conferences of interest were selected to be; ACC, SEC, B10, BSky, and A10. A total of 65 teams were in these conferences. In Figure 1, a histogram of the Adjusted defensive efficiency (AdjD) is shown for the team in the selected conferences. AdjD is a measure of points allowed per 100 possessions which has been adjusted for opponents. Most conferences have teams which are distributed over the range of AdjD. B10 seems to have the lowest AdjD. In BSky the teams allow a lot of points compared with the strength of the opponent they meet. If I plotted AdjD against ranking I would expect a positive correlation. In Figure 2, the rank and AdjD of teams in the conferences are plotted. The correlation is clear, and the calculated Pearson correlation is $r = 0.85$, which is a strong correlation.
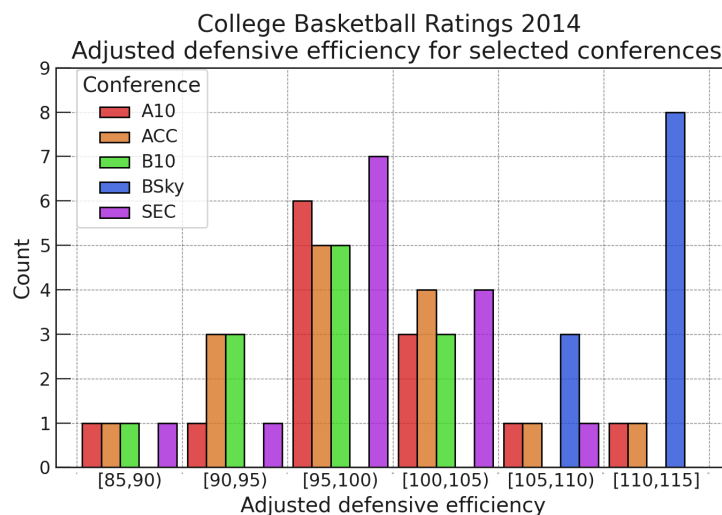

Figure 1: Adjusted defensive efficiency of teams in 5 selected conferences plotted as a histogram with intervals with a width of 5.
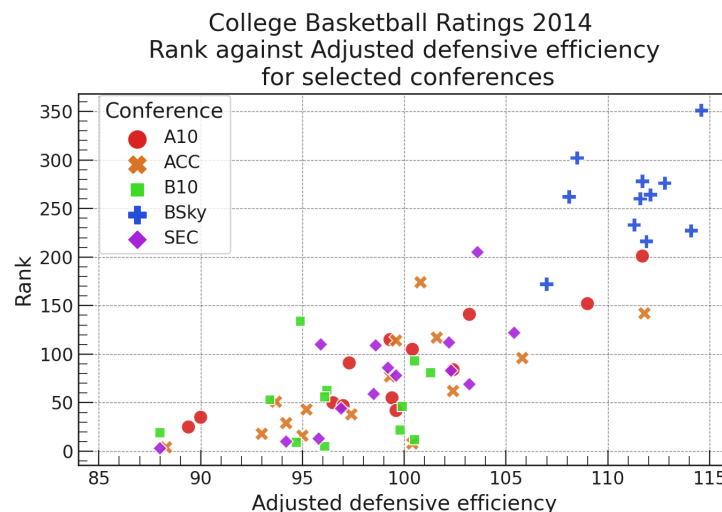

Figure 2: Rank against Adjusted defensive efficiency of the teams in the selected conferences.

1.2 Exercise 2

Comparing the 2009 and the 2014 datasets to show the change in the teams' performance. In particular, the change in Adjusted offense efficiency (AdjO). AdjO is a measure of points scored per 100 possessions which has been adjusted for opponents. I pulled the data of the 2009 ratings from kenpom.com on the 10th of February 2023. The data used is of teams that were in the same conference in both 2009 and 2014, and each of those conferences was of cause the selected conferences; ACC, SEC, B10, BSky, and A10. A total of 55 teams were found to fulfill that criterion. In Figure 3, the change in AdjO between 2014 and 2009 against the teams' 2009 rating. There is a lot of spread in the change and just from the figure, it is not clear if any conference changed more than any other. There is a negative correlation (Pearson $r = -0.60$) so teams with low AdjO in 2009 were more likely to have a higher AdjO in 2014 and the other way around.
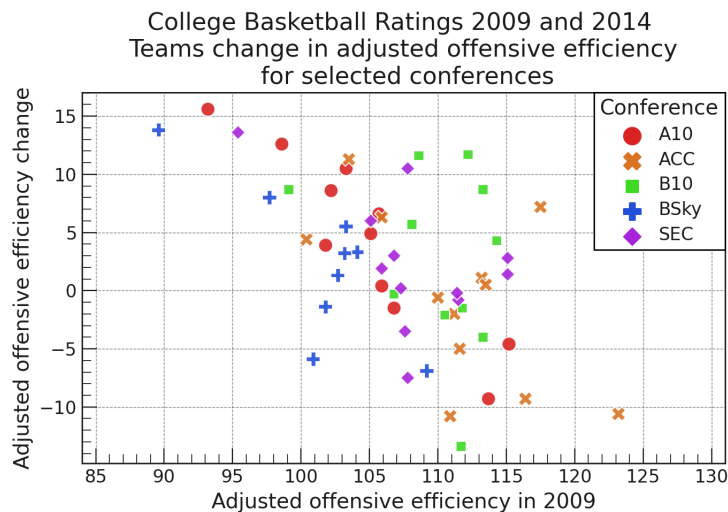

Figure 3: Change in AdjO between 2014 and 2009 plotted to the teams rating in 2009.

In Table 1, the mean and median of the change in AdjO between 2014 and 2009 for the teams in each conference are shown. A10 has the most improvement while ACC has the most recession. The mean and median are also calculated for all the teams, not the 5 conferences mentioned above. I found 275 teams that were not in the selected conferences but played in both 2009 and 2014. Their mean and median change is labeled as "Rest (All)". I also calculated it for all the teams which were in the same conference in both 2009 and 2014. There were 209 teams selected. Their mean and median change is labeled as "Rest (Same Conf)". T On average there is a positive change in the AdjO for the teams which played in both 2009 and 2014.

Table 1: Table of the mean and median changes in AdjO between 2014 and 2009

Conferences	Mean	Median
A10	4.34	4.90
ACC	-0.625	-0.05
B10	2.67	4.30
BSky	2.32	3.20
SEC	2.28	1.65
Rest (All)	2.60	1.90
Rest (Same Conf)	2.81	2.00

1.3 Exercise 3

The analysis which was done in sections 1.1 and 1.2 is redone with a conference added to the list of selected conferences. The additional conference is "BE". In Figure 4 the AdjD in 2014 for the teams in the six conferences is shown. There are 75 teams plotted, so the conference "BE" had 10 teams in it in 2014. Be aware, as the conferences are listed in alphabetical order, the colors corresponding to a given conference may have changed between sections 1.1 and 1.2, and section 1.3.

In Figure 5 the change in AdjO between 2014 and 2009 is shown with all 6 conferences plotted. Here only the teams which were in the same conference in both 2009 and 2014 have been plotted. That makes a total of 62 teams.

In Table 2 the mean and median for all the conferences are the same as teams which changed conference is not allowed. "BE" has been added with a mean of 1.14 and a median of 1.90. I also calculated the mean and median change for all the teams with did not change conf between 2009 and 2014. Here there were 202 teams. Again, the AdjO has on average increased. The reason for this is the change in and out of the conference of interest and maybe inconsistencies.
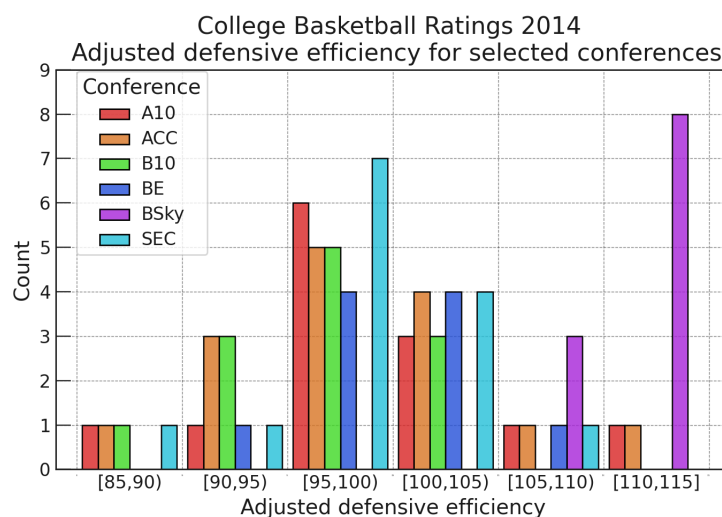

Figure 4: Adjusted defensive efficiency of teams in 6 selected conferences plotted as a histogram with intervals with a width of 5.
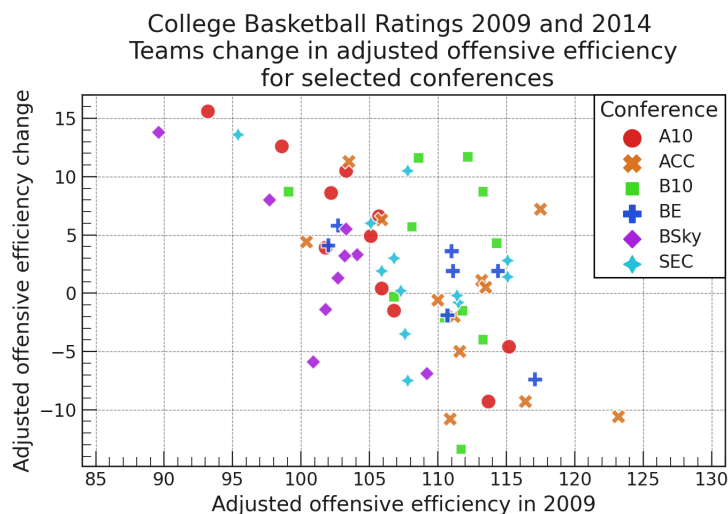

Figure 5: Change in AdjO between 2014 and 2009 plotted to the teams rating in 2009. The teams are from the 6 selected conferences.

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Table 2: Table of the mean and median changes in AdjO between 2014 and 2009

Conferences	Mean	Median
A10	4.34	4.90
ACC	-0.625	-0.05
B10	2.67	4.30
BE	1.14	1.90
BSky	2.32	3.20
SEC	2.28	1.65
Rest (Same Conf)	2.87	2.05