The Effectiveness of the 2023 MLB Rule Changes

Senior Capstone Research Project
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I. Abstract

The purpose of this study is to determine if the 2023 rule changes the MLB made to the game had an effect on the attendance of the games. This project examines baseball data from the 2014 season to the 2024 season to see if there was a meaningful effect. Using Python we're able to determine trends, predict the future of attendance, and finding relationships between game time and attendance. The results from this study should give us a better understanding of how the rule change affected the overall game and what the future of baseball could look like.

II. Introduction and Background

Baseball has been considered America's pastime for over a hundred years but in recent times has seen a decline in popularity due to many factors such as rising cost, more engaging sports, and most importantly length of games. Because of this Major League Baseball (MLB) saw its largest decline in game attendance over the nine years from 2012 to 2022, not including the 2020 covid season. Due to this the league implemented numerous rule changes in order to decrease game time in an attempt to get more spectators through the gates and into the seats of stadiums. These rule changes include implementing a pitch clock, where the pitcher has 20 seconds to make a pitch, if there are runners on base, or 15 seconds if the bases are empty. Another rule change is the banning of the shift. Prior to the change, teams would shift their infield players towards the side of the field where the current batter would "pull" the ball if hit. This resulted in less offense which made MLB ban it in favor of increasing the action on field.

The changes also limited the number of pickoffs to three as to not have the games drag on with the pitcher attempting to get the base runner out. In a similar way, they also limited the

number of timeouts a batter could take per at bat to only one. Lastly, the league increased the size of the bases from 15 inches square to 18 inches square in an effort to create more action on the base paths. With the size increased, the distance a runner has to travel is shorter there by encouraging more stolen base attempts and increasing the amount of action per game.

In 2024 the MLB earned around 12.1 billion dollars in revenue but around 15 percent of that money came just from advertising. Prices for placing an advertisement in a stadium can vary greatly depending on the how popular a team is, the stadium, the length, and type of advertisement, for example a large sign at Oriole park in Baltimore can cost anywhere from 30 to 40 thousand dollars and a season long ad like T-Mobile did behind home plate can cost millions of dollars. Advertisers know about team loyalty and they know that it can easily be turned into brand loyalty which is why they want to get their ads into stadiums where thousands of dedicated fans will start associating their company or product with their favorite team.

Using python we will be analyzing the attendance of teams using the Holt method, Holt Winters Method, and Autoregressive Integrated Moving Average (ARIMA) models.

III. Literature Review

There exist a lot of sports analytics for baseball, including viewership/attendance analysis. Such as time series analysis, where the future two years were predicted (Molis, 2023[1]). However, the 2023 rule changes have significantly impacted these trends. In fact, Major League Baseball (MLB) attendance was at an all-time high in 2023 (Adler, 2023[2]). This research will continue to analyze this trend to see if the rules had a lasting impact on game to game attendance. Another major factor in MLB attendance is each team's success (Davis, 2009[3]).

More successful teams such as the New York Yankees and the Los Angeles Dodgers tend to see higher attendance compared to the other 28 teams in the league.

IV. Data

For our analysis, we used data from baseball-reference.com due to the amount of data and the option to export the data as an excel spreadsheet. We pulled data from 15 random teams for the 2014 to 2024 seasons but during our analysis omitted the 2020, 2021, and 2022 seasons due to Covid-19 restrictions and it is taking time for things to return to normal. We also pulled the total yearly attendance data for each team in order to use for simple predictions using exponential smoothing. In order to process the data, we added a column of years and had to exclude double headers, which is when a team plays two games on the same day back to back. This is because ticket sales for days with double headers only require an attendee to purchase a ticket for the first game to get into the second game, therefore in our dataset the attendance for the second game was missing.

V. Methods

In order to get a comprehensive analysis for the MLB we looked into the trends of the 15 teams we picked and conducted an analysis on all of them to get our average change in attendance for the MLB. First the dataset was loaded and then the attendance for the 2020 season was set to zero since the season was shortened from 162 games to just 60 and the games were played behind closed doors with no spectators. Then we converted the “Date” column into datetime objects to make it easier to use later in our analysis. We used a 30-day moving average on each team’s daily attendance to smooth

out the data and created a new column to store these new values. These values were then used for our two time series; before covid (2014-2019) and after the rule changes (2023-2024).

Then we graphed and conducted a simple analysis on game to game attendance and tried to identify any trends throughout the years as shown in figure 1, however we were able to identify any trends and conducted a deeper analysis by zooming in on specific years. The year we decided on looking close into was the 2014 season in order to identify any trends that occur during the season like attendance increasing closer to the end of season or at the beginning of the season and found that there weren't any and each season had lots of noise since attendance would frequently peak and then valley immediately after.

Following this we used simple exponential smoothing as shown in figure 2 as a baseline forecast since we're conducting a time series analysis and the data had no clear trend, seasonality, and contained lots of noise which could impact our forecast on attendance. However using a low, medium, and high alpha all three of the lines were very similar and almost the same which led us to believe that the data has little to no trend.

Next we conducted an analysis using the Holt's Linear Trend method to look for a trend of decreasing attendance from 2014 to 2019 and predict what attendance would look like without the rule change. Following the Holt's Linear Trend method we switched to the Holt-Winters method since baseball is a seasonal sport with it usually starting at the end of March or the beginning of April and ending late September or early October. By using the Holt-Winters method we were able to add a seasonal component to our forecast which would tell us if there were any recurring trends we couldn't identify.

The following graphs represent the analysis we conducted for the 15 teams we looked at.

VI. Observations and Analysis

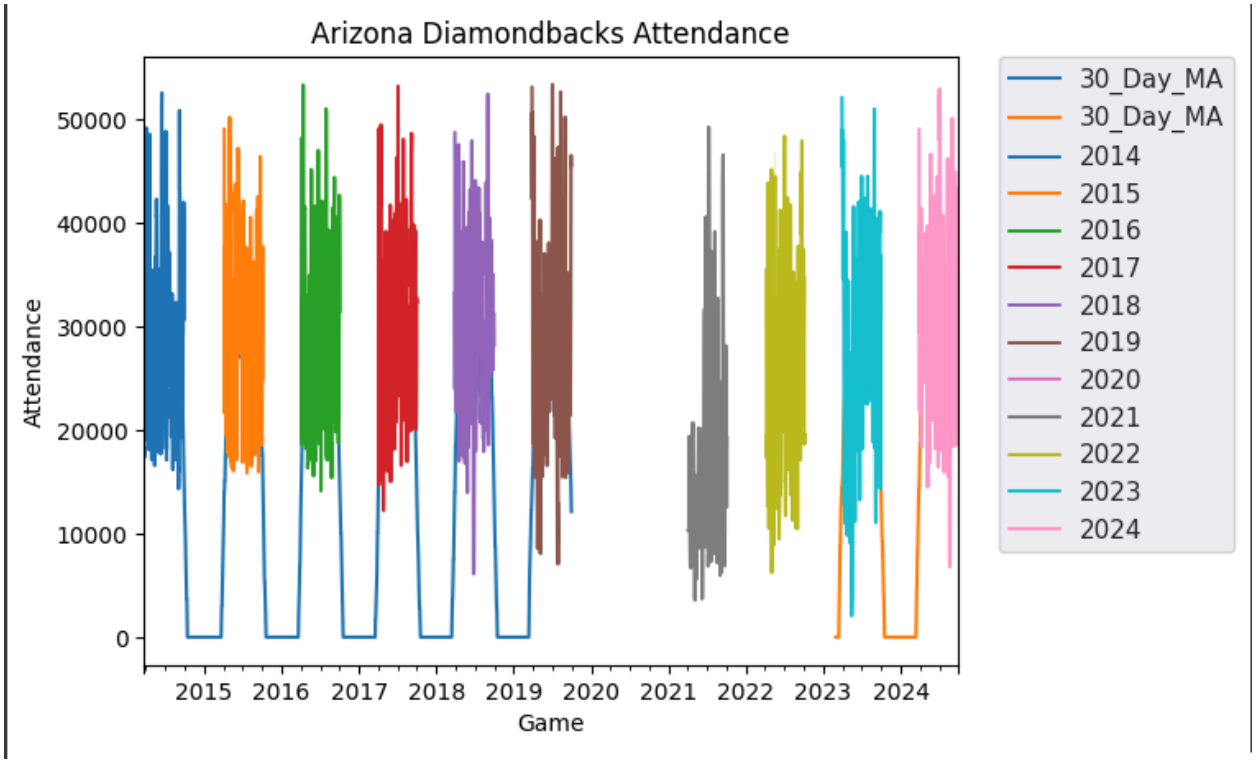

Figure 1. Arizona Diamondbacks Attendance (2014-2019)

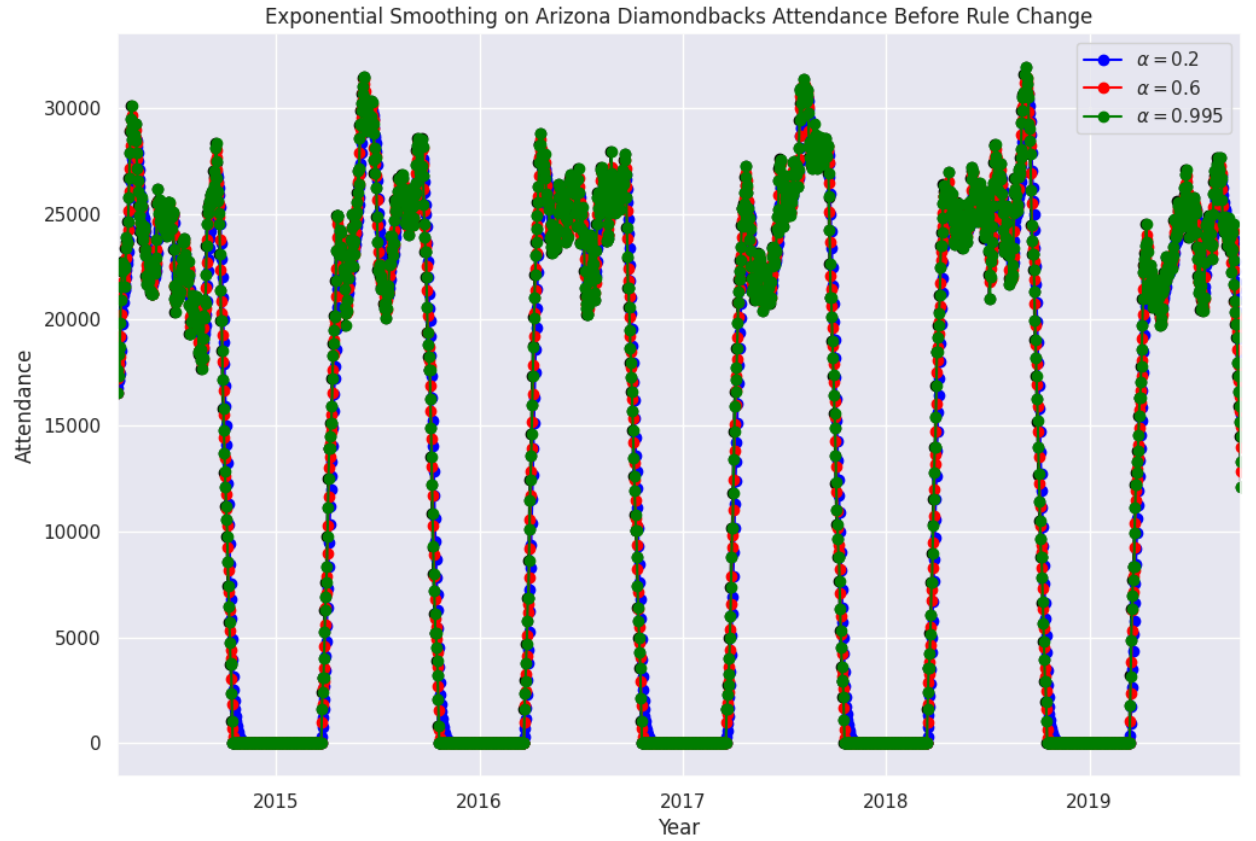

Figure 2. Exponential Smoothing on Diamondbacks Attendance Before the Rule Changes (2014-2019)

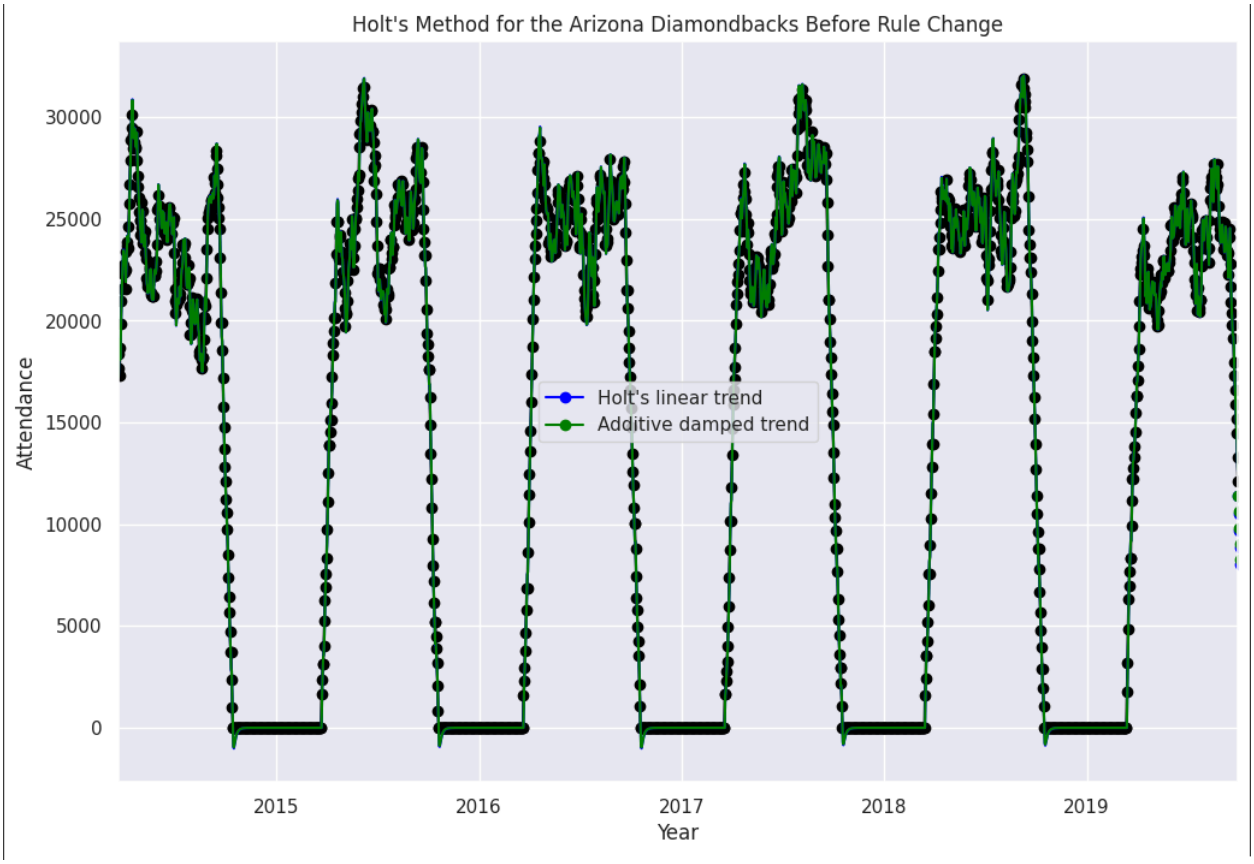

Figure 3. Holt's Linear Trend Method on Diamondbacks Attendance Before Rule Changes (2014-2019)

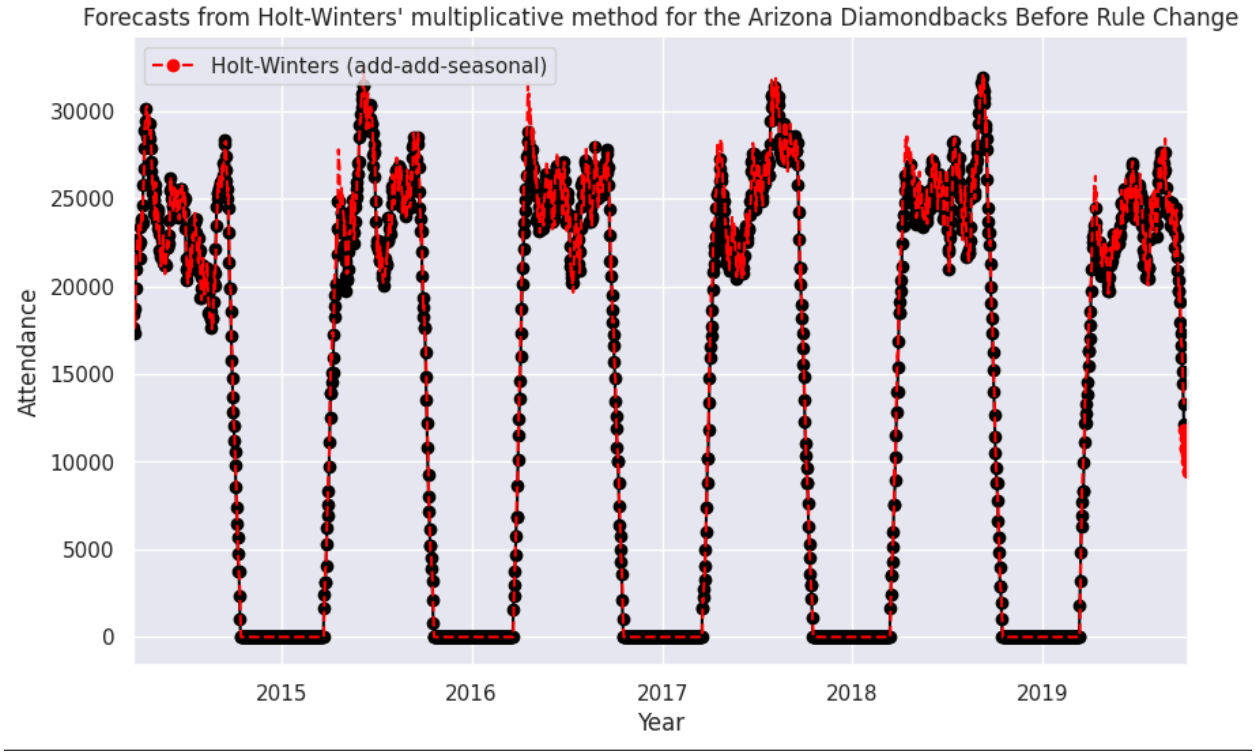

Figure 4. Forecasting Attendance using Holt-Winters method with additive seasonality Before the Rule Changes (2014-2019).

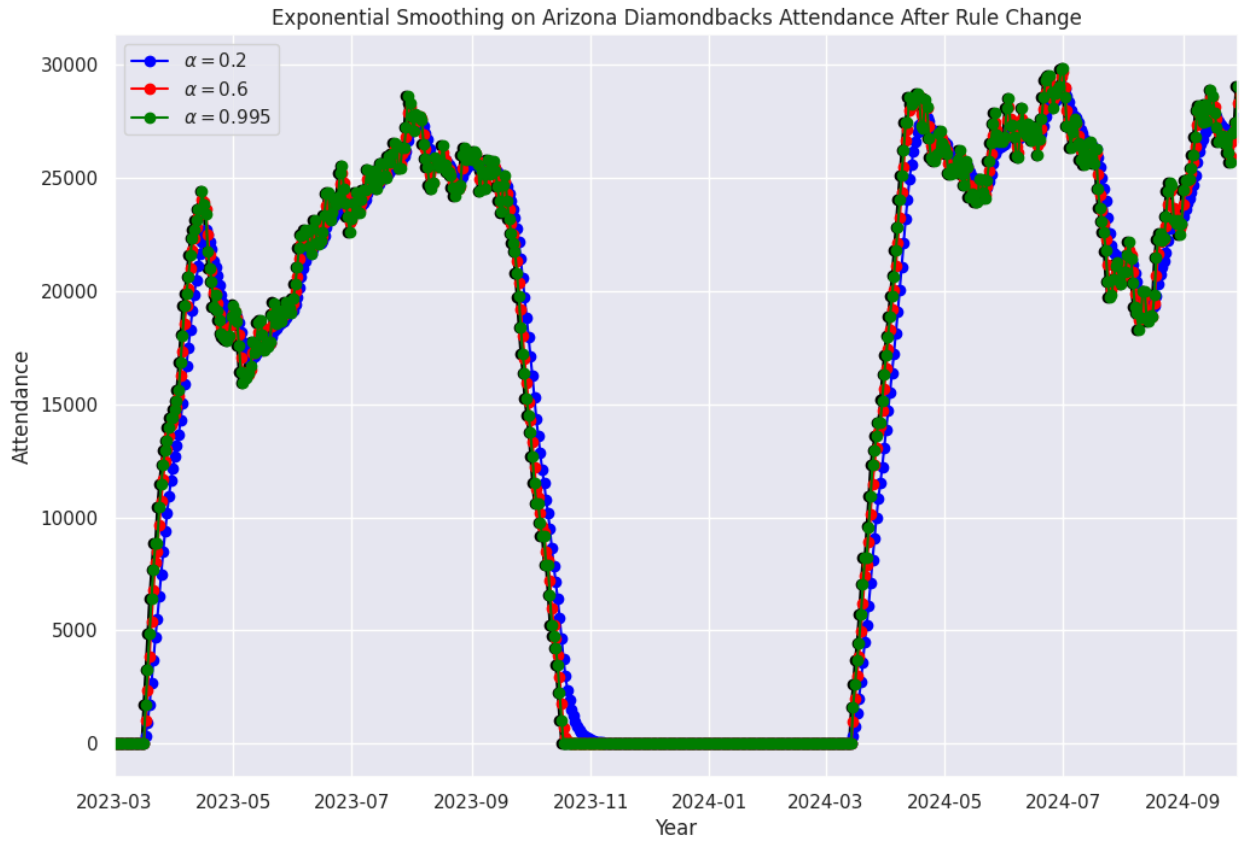

Figure 5. Exponential Smoothing on Diamondbacks Attendance After the Rule Changes (2023-2024)

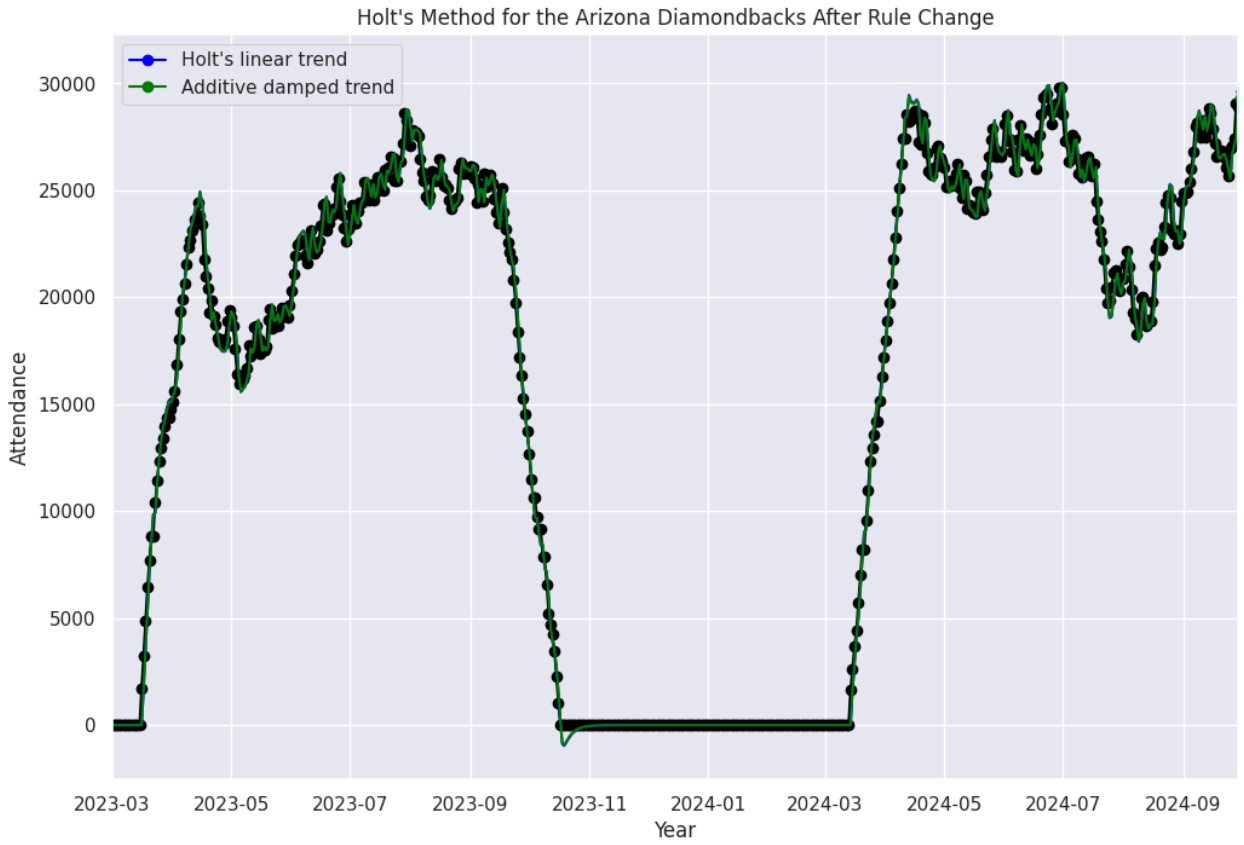

Figure 6. Holt's Linear Trend Method on Diamondbacks Attendance After Rule Changes (2023-2024)

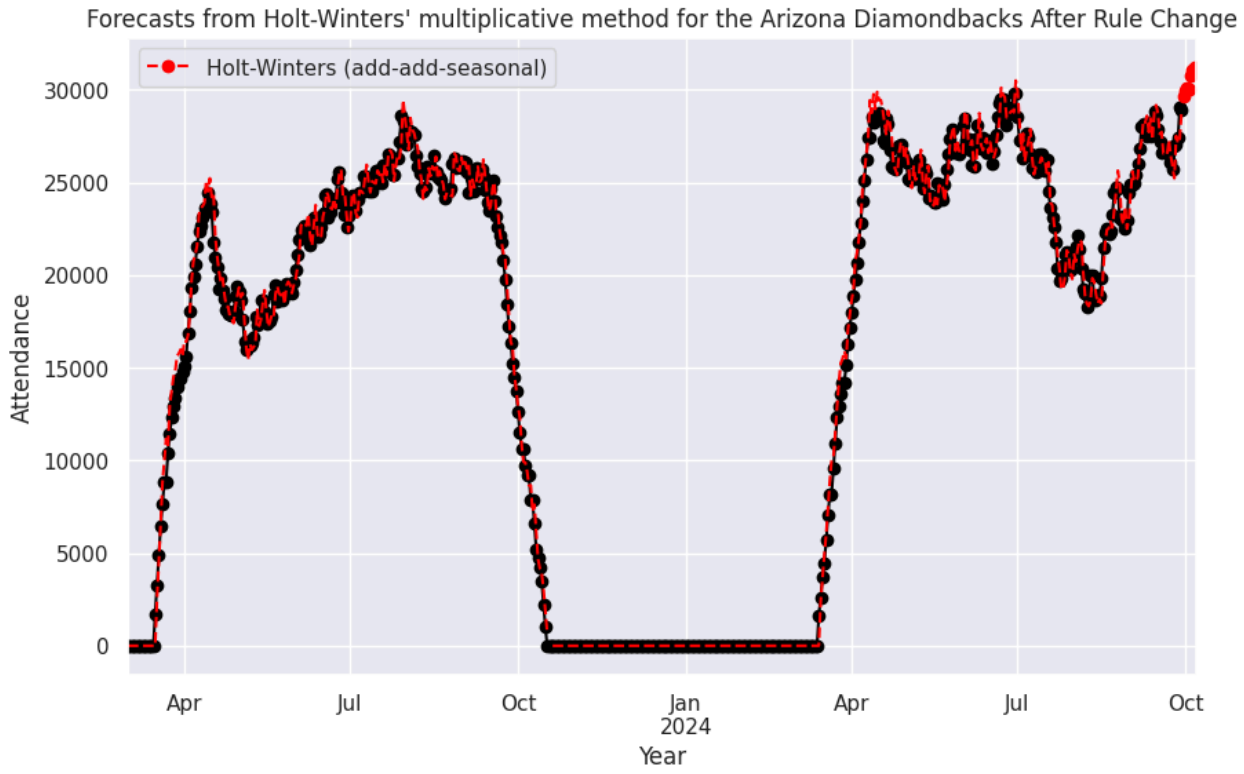

Figure 7. Forecasting Attendance using Holt-Winters method with additive seasonality before the Rules Changes (2023-2024).

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Average Change in Yearly Attendance before rule changes 21.53717624942601
Average Change in Yearly Attendance after rule changes 1565.964951797083

Average Percent Change in Yearly Attendance before rule changes 0.13511844122952746%
Average Percent Change in Yearly Attendance after rule changes 10.901408951439858%
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Figure 8. Average Change in Yearly Attendance Before and After the Rule Changes

After processing and analyzing the data we found that before the 2023 rule change the Arizona Diamondbacks had a change in yearly attendance of -6.15% which is almost 3 times the average for the entire MLB prior to the rule change. We also found that after the rule change the Diamondbacks had an increase in yearly attendance by about 10.04%, as seen in Figure 8,

however in the 2023 season the Diamondbacks made it to the World Series which we believe contributed to the large increase in attendance. Because of this we looked at less popular teams like Oakland Athletics which in 2024 had their third lowest attendance per season at around 500,000 attendees total. Following the analysis on Oakland Athletics we found that prior to the rule change the team saw a decrease in yearly attendance of about -1.9% which was surprising since there have been numerous news articles in the past few years about empty seats at the stadium. Looking into the data we can see that before the 2020 season the stadium was regularly reaching 1.5 million attendees but following the reopening of stadiums in the 2021 season they have failed to get even 1 million attendees. In fact the highest attendance for Oakland in the past 5 years was in 2024 at only about 900 thousand attendees. Following the rule change Oakland had a greater increase in attendance than the Diamondbacks with an annual increase of about 11.9%, however the reason we believe they had a higher increase was because the team announced that the 2024 season would be their last season in the Oakland Coliseum and afterwards would move to Sacramento.

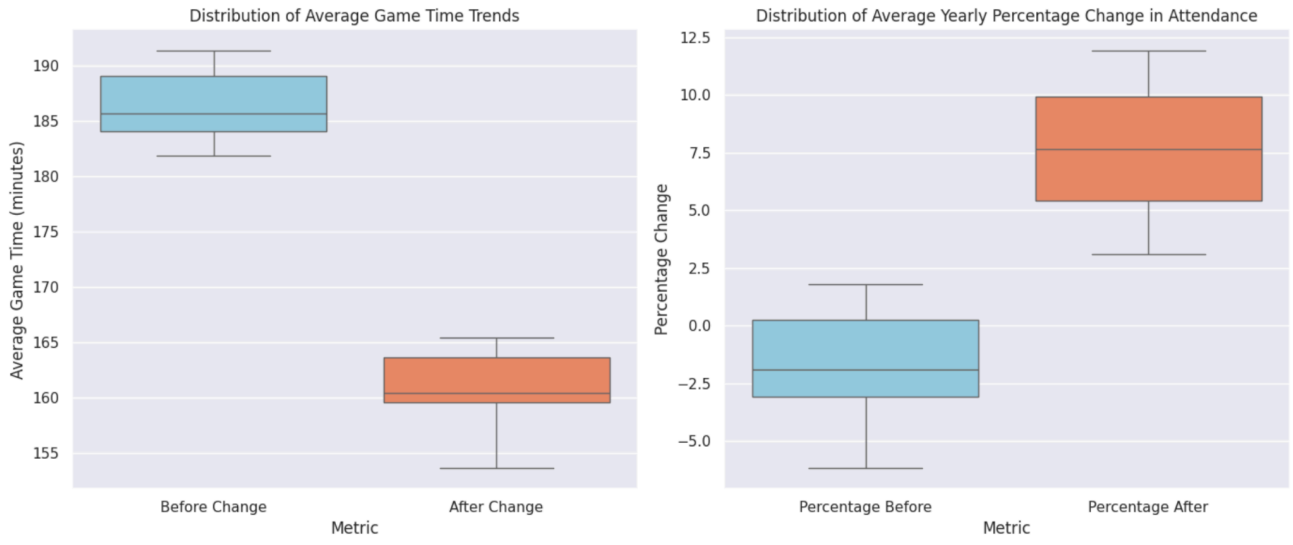

Figure 9. Box Plots showing the Distribution of Change in both categories

After analyzing our 15 teams and calculating the average percent change, we found that the MLB had a yearly decrease in attendance of about -1.8% which may not seem to be significant but was over a 6 year period and was projected to continue year after year which would lead to a loss of millions of fans. Luckily for the MLB following the rule change there was an increase in attendance by about 7.59% which is significant when you think about the millions of people baseball draws into the games.

VII. Conclusion

Major League Baseball has seen a positive change since changing the rules in 2023. There is a lot of noise surrounding COVID and future predictions, which limits our research. However, by using exponential smoothing, the Holt's linear method, and Holt-Winters method we were able to give more weight to the 2023 and 2024 season and eliminate noise, capture simple trends, and look at larger trends caused by seasonal effects. We believe that a yearly increase in attendance of 7.59% is significant due to the millions of fans that attend baseball games, and that the MLB should start taking advantage of the increase by focusing on advertisers and sponsors to bring in even more revenue. We also find a significant difference in game time before and after the 2023 rule changes. Before, games lasted an average of 186.5 mins (~ 3 hr) and then dropped to 160.69 mins (~ 2 hr 40 mins) after the rules changed, which is about a 14 percent decrease in game time. All of these findings show that the MLB did have success in changing some of the rules of the sport to decrease time and bring more fans into the stadiums.

Works Cited

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