

“Hit the Cut-Off Man!”

<https://github.com/jbart99/smtcutoff.git>

The project is an attempt to combine measurements of accuracy and speed on an outfielder's throw to a base to determine efficiency. Beyond this, there is an attempt to create a method to determine the distance of the throw at which an outfielder should no longer throw straight through, but use a cut-off man for a likely greater efficiency than the alternative.

At every stage of baseball development, from Little League to Major League Baseball, there are vital plays to every game involving a throw from an outfielder. Depending on where the outfielder is and to which base the throw is headed, the outfielder will either throw the ball straight to the base, soaring through the air or on a bounce or two, or use a cut-off man to relay the throw to the base for a farther distance. “Hit your cut-off man!” is a phrase anyone close to the game of baseball has heard uttered many times. But, at the professional level, at what distance should an outfielder no longer throw straight to the bag and instead hit the target of the cutoff man? The answer to this should involve many facets. It should be a crossover of how quickly the ball can get to the player at the base on either a relay or full-distance throw with the decreasing accuracy of a throw from a farther distance for the choice of maximum efficiency. It should also include the effectiveness and accuracy of each individual cutoff man. Discovering this change-over distance, or an analysis of how this distance could be calculated for any individual player, is the question I attempted to answer this summer.

In my attempt to answer this question I converted all of the data given for the challenge into a simpler, easier to use database. I then used SQL and filtering to gather the data points that only referred to plays that had outfielder relays with a cutoff man. I then calculated several factors to explore for these relays, including how much the throw missed a designated “target” for the cutoff man as well as the miss by the “target” above the base for the throw from the cut-off man, the angle that the throws were off from the target by, and the speed that the throws had as well as the overall relay. After exploration, I then designated the efficiency of the relay or throw as the overall speed of the ball from the outfielder’s throw to the player making the tag’s catch and subtracted double the distance that the target was missed by. This was calculated for

every relay and every type of relay, recording who the outfielder were as well as the cutoff man for future exploration.

A similar process was then accomplished for the throws that were directly from the outfielder to the base. This was done using a simpler filtering for any throw from an outfielder to a catcher or infielder (other than catcher), and then removing any plays under a certain speed that would not have been a competitive play as well as removing the plays where the throw was actually to a cutoff man. The same measurement was used for efficiency, except using the accuracy of the outfielder's throw to the end target instead of the cutoff man's.

Once I had done this, it was time to explore the differences between the data sets. I began by checking if there would be enough data for each outfielder to analyze them separately within this data set. Unfortunately, there was not enough data uncovered for each player for analysis, so I had to view the data aggregately. In my analysis, I removed the throws that were off of the target by more than 15 feet, with a negative efficiency, and a speed of under 60 feet per second to ensure only competitive throws and relays to a base were being considered. I then explored the data and determined that a quadratic fit for both sets of data would provide the best estimation, and the overlap of the two would provide an estimate of the minimum cut-off distance on average. The result was an average minimum cut-off distance of approximately 322 feet.

While this result is certainly the beginning of an analysis to develop a proper metric of efficiency and a useful tool to help with outfielder decision making, it will require future changes. There will need to be further investigation to the impact of accuracy to the efficiency of a throw to finalize and improve the metric. Also, if enough data collection can be for each individual player, a quadratic analysis can be run to provide them and their coaches with a specified minimum cut-off distance. The data appears to shift from full distance throws to

cut-offs around a distance of 280 feet, but the best fit lines of the two cross over at 322 feet, so further analysis with more dispersed data in a larger set could reveal that, buy and large, outfielders should be working on making further throws without using a cutoff man.

Appendix



