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A Statistical Scoring System for Manager Voting for the Rawlings Gold Glove Award

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Introduction

Every year at the end of the Major League Baseball season, Rawlings awards the Gold Glove award to the best fielding player at each position in both the National and American Leagues. Different from most awards, the Gold Glove is not given based on performance data alone. Instead, managers and coaches across the league vote for the players they believe should be awarded this honor. Players must be qualified for the award, and managers and coaches may not vote for their own players[1]. However, this award has the potential to invoke controversy because it is given according to votes. Some managers and coaches may not know who to vote for and end up voting based almost entirely on name recognition. That begs the question: how can managers and coaches know who to cast their votes for without tracking roughly fifteen players at every position? The goal of this research is to develop an easy answer for them to decide whether a player is worth a vote. It is based on past data from first base and shortstop, two active positions in baseball. While this is just a partial analysis surrounding two major controversies, this type of analysis can be carried out for any baseball position over a reasonably large range of years. This paper will focus on the first basemen who played during the career of Rafael Palmeiro and the shortstops who played during the career of Derek Jeter.

The Controversies

In 1999, Rafael Palmeiro of the Texas Rangers won the American League Gold Glove award at first base. Palmeiro was an accomplished player and well known across the league, and this was his third straight Gold Glove. However, many people, including Palmeiro himself, felt this particular year's award was undeserved. The reason was that Palmeiro had played a total of

[1] "Selection Criteria," *Rawlings,* accessed March 14, 2016, http://rawlings.com/awards/gold-glove/selection-criteria.

28 games at first base that year. In contrast, he had been the Rangers' designated hitter for 128 games of that 162 game season. The designated hitter does not play a fielding position at all, but instead only hits in the lineup. It seemed that no one that year had expected Palmeiro to win, but he still earned the most votes from managers and coaches. "I laughed when I heard about it," he said of winning the award[2]. It is difficult to come up with any reason that Palmeiro should have won the Gold Glove at first base that year, other than perhaps the managers and coaches knew of his past greatness and did not pay enough attention to the other first basemen during the 1999 season. He likely won the award based entirely on the recognition of his name as a great first baseman. If those voting had looked at his statistics for the season, they would have seen that he was not even close to a clear choice for the award. If Rawlings had the foresight to disqualify players who did not play many games at a position, then it is possible that Palmeiro would have never been qualified in the first place.

Since then, Rawlings has decided to disqualify those who played less than a certain number of games or innings. The current qualifications require that a player have played at least 690 innings by his team's 137th game to be qualified for the award[3]. It is reasonable to think that this would eliminate this sort of controversy from the possibilities. Perhaps the Gold Glove made a turn toward fairness. However, another controversial win at the end of the 2010 season proved that the work was not done. The New York Yankees' captain Derek Jeter received the 2010 American League Gold Glove at shortstop. Using a number of statistics, sports writer Michael Perchick argued that Jeter was actually the worst fielding shortstop in the American League that

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[2] Associated Press, "Controversy surrounds A.L.'s Gold Glove awards," *Moscow-Pullman Daily News* (Moscow, ID and Pullman, WA), November 10, 1999, url: https://news.google.com/newspapers?nid=2026&dat=19991110&id=M70jAAAAIBAJ&sjid=uNAFAAAAIBAJ&pg=1444,2336696&hl=en

[3] "Selection Criteria," *Rawlings,* accessed March 14, 2016, http://rawlings.com/awards/gold-glove/selection-criteria.

year. Perchick declared Jeter to be wholly unqualified for the award based on his performance in the field, and suggested a handful of other players who would have been more qualified. That list included Alexei Ramirez of the Chicago White Sox, Cliff Pennington of the Oakland Athletics, and Alex Gonzales of the Toronto Blue Jays. Perchick does not settle on a definite name for the Gold Glove award, but he is certain it should not belong to Jeter[4]. If there was a way to simplify fielding down to a simple score, one that takes only minutes to compute, then perhaps an answer could be reached.

From the 1999 and 2010 seasons, one thing is clear. There is a Gold Glove winner from each year who is thought to not deserve it. How can we tell, though, if the controversy is founded in fact or if team loyalties are the real source? In the sections following, the goal is to develop a single number score that can be used in determining whether a player is worth voting for as a Gold Glove candidate, or whether he is not particularly qualified for that award.

Data

All of the data collected follows the careers of the two controversially chosen players mentioned previously. Thus, there are two datasets. The first is the set of data collected on the American League starting first basemen who played from 1989 through 2005 and whose careers coincided with that of Rafael Palmeiro. The second set is that collected on the American League starting shortstops who played from 1996 through 2014 and whose careers coincided with that of Derek Jeter. The data is sorted by team and by year. If a team had more than one player at a particular position that year, the starting player is defined as he who played the most games for

[4] Michael Perchick, "Derek Jeter Becomes Latest Undeserving Player to Win Gold Glove," *Bleacher Report,* last modified November 12, 2010, http://bleacherreport.com/articles/515657-derek-jeter-becomes-latest-undeserving-player-to-win-gold-glove.

his team at that position. If a player was traded midway through the year, he is treated as the starting player for the team for which he played the most games through the first 137 games that the team played.

There are four main points of focus in the data, three of which would later go into the scoring system. The one that did not was used simply for qualification and disqualification of players, and that is the number of innings played at a particular fielding position. Using Rawlings' number of 690 innings (set in 2015)[5], players were retroactively marked as qualified or disqualified to win the award. There are a few possibilities for why starting players may not have reached enough innings, though they were the team's primary fielders at those positions. It is possible that the players were injured and not able to complete the season, but still played more games at a particular position than any other player on the team. It is also possible that a team did not have one set player for each position, but rather did some positions by platooning. This would mean that two or more players regularly played the position, but the player who played the most was given the marker of starting there. Some players may have also been brought up from the minor leagues after the season started or sent down to the minor leagues due to decreases in performance. In any case, if players did not meet the qualifications set by Rawlings, they were determined not to be qualified and their remaining data was ignored, so as not to skew results.

The other three points of focus are used in the development of a scoring system for players. The first of these three data points is the player's fielding percentage. Fielding percentage (Appendix A) is the number of outs completed divided by the number of chances. This is the simplest way to measure a player's general ability in the field. The other selected

[5] "Selection Criteria," *Rawlings,* accessed March 14, 2016, http://rawlings.com/awards/gold-glove/selection-criteria.

numbers were the number of assists a player made (Appendix B) and the number of errors he made during the season (Appendix C). These three particular areas were selected as they are common statistics used to track a player's progress during the year, and they are widely understood and available and used by experts as well as fans[6].

Scoring System

At this point, all of the aforementioned data was set up in a scoring system. Each type of data (fielding percentage, assists, errors) was scored so that the best player would be given roughly fifteen points, and the worst player would be given zero points. For the fielding percentage, this was done based on a linear system. In the case of the first basemen, the highest fielding percentage was .999, or 99.9% of outs made, and the lowest was .986 or 98.6% of outs made. All of the fielding percentage values were then scaled linearly so that .999 corresponded to a score of fifteen and .986 to a score of zero. The values were then rounded to the nearest integer. The same approach was taken for the shortstops using the high and low values for that dataset. The highest value for the shortstops was .995, or 99.5% of outs made, and the lowest value was .944, or 94.4% of outs made. The values were scaled linearly so that .995 corresponded to a score of fifteen and .944 to a score of zero. They were then rounded to the nearest integer.

The system used for the assists value was one in which the values were scaled based on their raw numbers. In the case of the first basemen, the scores were divided by ten and rounded to the nearest integer, so that the highest value (147 assists) would correspond to fifteen points,

[6] Michael Perchick, "Derek Jeter Becomes Latest Undeserving Player to Win Gold Glove," *Bleacher Report,* last modified November 12, 2010, http://bleacherreport.com/articles/515657-derek-jeter-becomes-latest-undeserving-player-to-win-gold-glove.

thus not giving it any weight significantly more or less than fielding percentage. Once again, a similar approach was taken for the shortstops, but had to be scaled appropriately. Based on this data, it appears that shortstops tend to make far more assists than first basemen. Thus, the scores were divided by 35 and rounded to the nearest integer so that the highest value (529 assists) corresponded to fifteen points.

A ranking system was used to score the value of the errors made. The player who made the fewest number of errors was ranked first, and the player who made the most errors ranked last. First place was given a score of fifteen points, second place given fourteen points, and so on, accounting for ties. Once again, setting the maximum value to fifteen gave these values a similar weight to the previous two data points of assists and fielding percentage. This was done for both the first base and shortstop position without need to be adjusted to accommodate the different positions.

For example, take the shortstop for the Baltimore Orioles (BAL) in 1996, Cal Ripken, Jr. That year, Ripken had a fielding percentage of .98, which corresponds to a score of 11 on the linear scale described above. He had 467 assists, which corresponds to a score of 13 when divided by 35 and rounded. With 14 errors that season, Ripken ranked fourth among other shortstops, yielding a score of 12 points.

Each of the three scores was then added together for each player (for the Ripken example he had 36 total points), giving the following two sets of scores, in which the topmost row displays the team of the player, and the rightmost column displays the year:

Scores for First Basemen 1989-2005

	BAL	BOS	CWS	CLE	DET	KC	LAA†	MIN
1989	32	34	*	29	27	37	37	*
1990	22	22	*	*	23	26	*	36
1991	20	29	*	*	27	*	30	30
1992	29	*	22	25	23	30	*	34
1993	34	11	16	29	21	32	28	31
1994	33	19	23	*	32	23	*	*
1995	39	24	*	*	*	41	32	*
1996	34	17	26	*	*	*	28	32
1997	29	14	12	28	28	39	18	*
1998	34	23	*	25	23	33	*	*
1999	27	16	*	32	24	*	*	33
2000	22	*	19	32	*	24	16	32
2001	*	18	31	24	*	18	*	35
2002	18	*	26	21	33	25	34	31
2003	24	32	37	21	19	*	*	31
2004	25	*	28	27	28	*	31	26
2005	*	25	32	20	*	*	35	26

	NYY	OAK	SEA	TB‡	TEX	TOR	MIL
1989	29	34	22	***	24	20	*
1990	*	36	*	***	30	36	36
1991	32	37	36	***	23	38	*
1992	38	30	*	***	37	29	*
1993	37	*	34	***	40	24	30
1994	*	*	*	***	22	29	*
1995	28	*	27	***	29	36	*
1996	34	21	21	***	34	*	*
1997	31	32	34	***	33	14	*
1998	27	17	42	31	18	27	**
1999	33	27	*	19	25	19	**
2000	28	27	38	23	34	19	**
2001	35	23	31	*	28	31	**
2002	*	*	35	18	*	21	**
2003	*	22	40	38	31	25	**
2004	*	23	37	33	23	33	**
2005	*	26	32	32	39	*	**

*Indicates a year where the starting player was disqualified
**Indicates a year where the team was not part of the American League
***Indicates a year where the team did not exist in Major League Baseball
† Previously TBD
‡Previously CAL and AHA

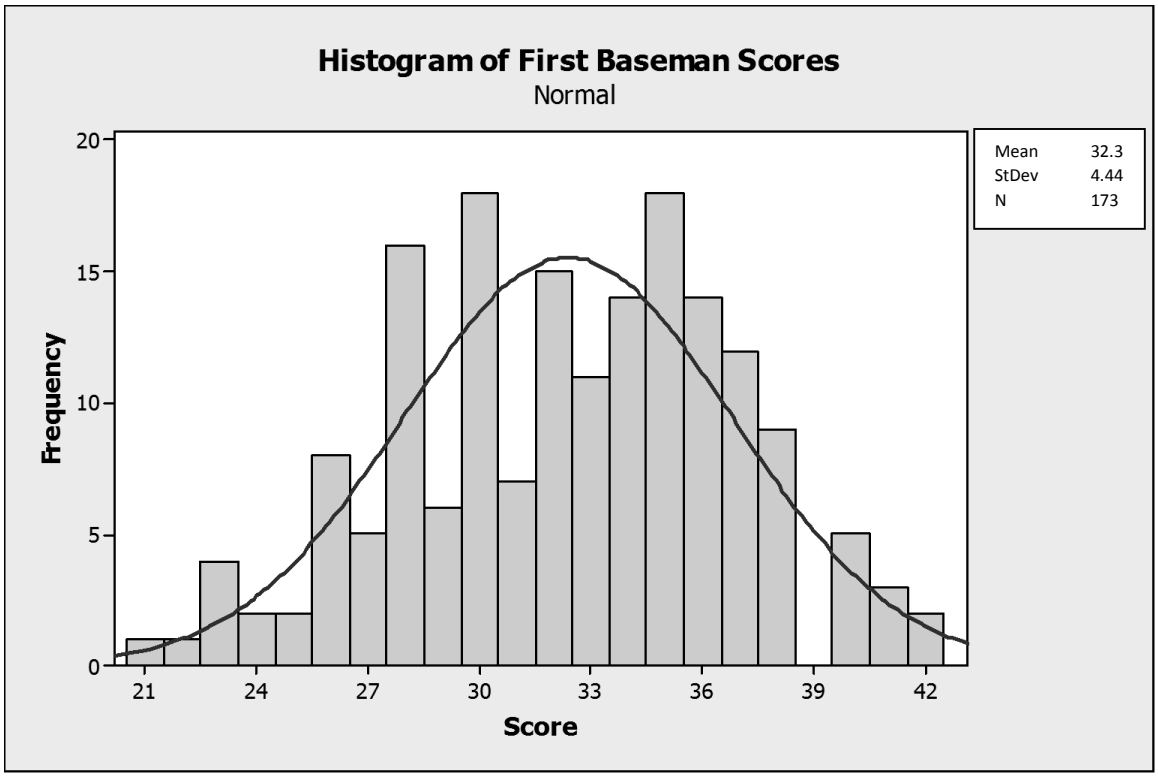
Scores for Shortstops 1996-2014

	BAL	BOS	NYY	TB	TOR	CWS	CLE	DET
1996	36	27	25	***	28	35	28	*
1997	34	25	30	***	37	28	38	34
1998	41	23	37	31	31	15	42	35
1999	43	27	32	11	31	19	31	39
2000	29	27	19	20	29	18	42	37
2001	*	*	27	12	38	37	38	21
2002	42	24	28	31	*	36	39	*
2003	32	28	27	26	25	26	*	*
2004	30	*	34	24	*	25	37	32
2005	31	29	36	27	18	34	30	*
2006	28	36	32	*	*	34	33	22
2007	32	25	31	*	*	35	30	18
2008	*	*	34	27	*	34	36	29
2009	36	*	36	24	37	28	*	27
2010	37	26	39	32	32	31	*	*
2011	40	28	28	*	29	29	28	38
2012	45	28	32	*	34	34	25	37
2013	33	33	*	38	*	25	31	38
2014	33	*	31	22	22	34	*	*

	KC	MIN	LAA	OAK	SEA	TEX	MIL	HOU
1996	37	21	28	33	32	36	19	**
1997	38	24	31	*	20	22	24	**
1998	*	25	33	16	30	*	**	**
1999	37	20	*	29	32	21	**	**
2000	42	24	*	29	38	30	**	**
2001	43	18	26	37	31	29	**	**
2002	25	21	29	29	22	38	**	**
2003	26	34	34	28	*	41	**	**
2004	19	37	37	33	*	29	**	**
2005	26	*	38	*	*	32	**	**
2006	27	*	30	*	27	38	**	**
2007	25	21	39	*	25	29	**	**
2008	*	*	*	28	27	40	**	**
2009	*	*	35	26	*	27	**	**
2010	31	*	23	27	*	33	**	**
2011	31	*	33	22	27	21	**	**
2012	20	*	28	*	37	28	**	**
2013	31	42	25	19	*	28	**	*
2014	30	34	36	31	18	25	**	*

Analysis and Discussion of Results

Histograms of each of the score sets were made. Discussion will first focus on the scores for the first basemen from 1989 through 2005. The following is the histogram for that dataset:



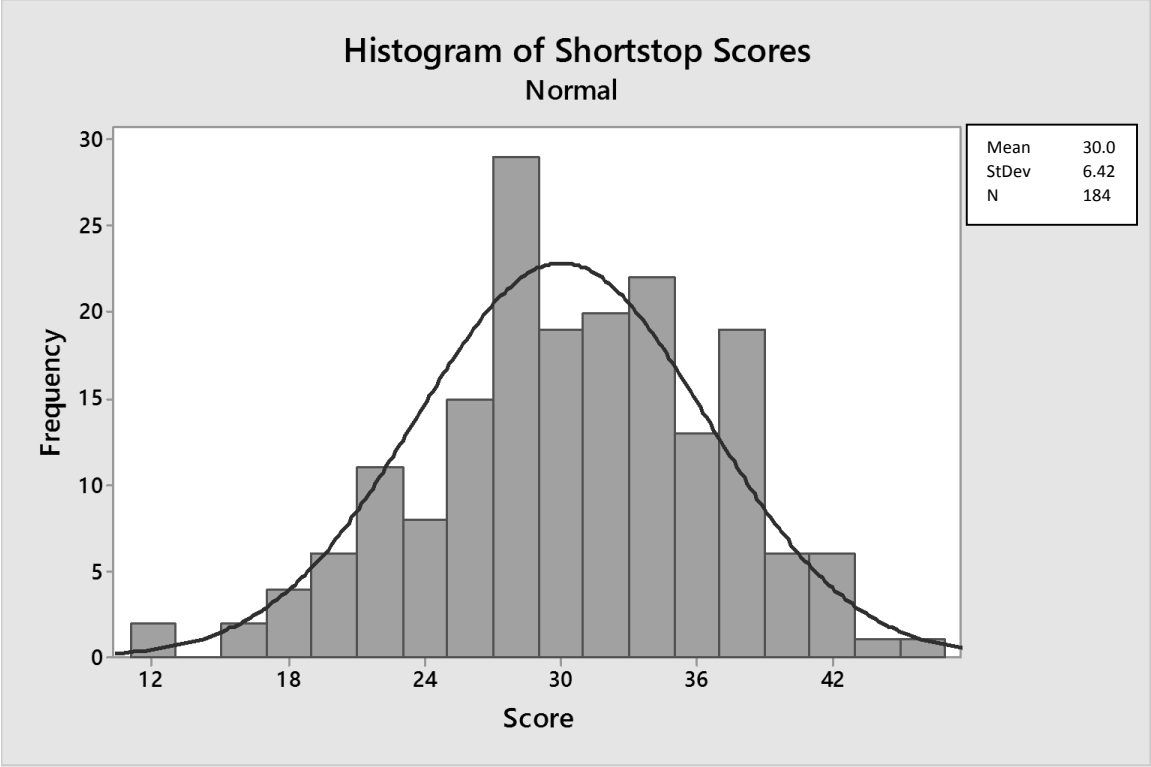
Fitting the data to a curve, it can be seen that the set is approximately normal with mean $\mu = 32.38$ and standard deviation $\sigma = 4.439$. The question now is what marker on this curve should be used to determine whether a player is deserving of a Gold Glove award. In one season, it is theoretically possible for there to be a maximum of fifteen eligible players. Taking the top three players at a position as deserving of a Gold Glove in a single year means that a player must be in the top one fifth of players (top 20%) in order to deserve the award. The first basemen can be evaluated on the curve above using the standard z-score to evaluate their place in the distribution. The z-scores were calculated using the following equation (where x is the player's overall score for that year):

$$z = \frac{x - \mu}{\sigma}$$

Retroactively applying the previously mentioned qualification system, it is clear that Rafael Palmeiro would not be qualified to win the Gold Glove at first base for the 1999 season. That still leaves the question, however, of which player should have won the award. Palmeiro himself and many others believe that his teammate Lee Stevens should have won the Gold Glove at first base that year[7]. To test this theory, Stevens' score from that year must be analyzed. As Stevens was the starting first baseman for the Texas Rangers that year, his score can be found in the chart above. Stevens' score using the scoring system developed earlier was 25 points. The z-score corresponding to that particular score is -1.66. In order for a player's score to correspond to the top 20% in this particular dataset, a standard z-table shows that a minimum z-score of .85 is required. However, looking only at the scores from 1999, not a single player reached the minimum z-score of .85 that gives them the mark of deserving a Gold Glove award. In order to do so, calculation determined that they would have needed a score of at least 36 points. Clearly, Rawlings cannot opt out of giving out a Gold Glove award, and managers cannot choose not to vote for anyone. In cases of this nature, it is suggested that the player or players with the highest score deserve the award by default and are the most eligible candidates for votes from managers and coaches. In the case of the 1999 season, this would mean that the managers should have chosen to vote for either the starting first baseman from the Minnesota Twins (Christian Guzmán) or the starting first baseman from the New York Yankees (Tino Martinez).

[7] Associated Press, "Controversy surrounds A.L.'s Gold Glove awards," *Moscow-Pullman Daily News* (Moscow, ID and Pullman, WA), November 10, 1999, url: https://news.google.com/newspapers?nid=2026&dat=19991110&id=M70jAAAAIBAJ&sjid=uNAFAAAAIBAJ&pg=1444,2336696&hl=en

Moving the discussion now to the shortstops, the following is the histogram of the set of their scores from 1996 through 2014:



Once again fitting the data to a curve, it can be seen that the set is approximately normal with mean $\mu = 30.03$ and standard deviation $\sigma = 6.421$. Once again, only players that fall into the top one fifth of overall scores will be considered as deserving the Gold Glove award for their year. The z-scores were calculated using the same equation as was used in the case of the first basemen.

Unlike Palmeiro in 1999, Derek Jeter in 2010 certainly played enough innings to be considered qualified to receive a Gold Glove award. However, the question is whether he deserved to win the award in that year. In 2010 (and all of his career), Jeter played for the New York Yankees. Looking at the scores calculated previously, his score for 2010 was 39 points. This corresponds to a z-score of approximately 1.40. Once again, in order to be in the top 20% of players, a player must achieve a minimum z-score of .85, which Jeter clearly surpassed in that

season. Thus, despite having the worst fielding percentage that year[8], Jeter's superior number of assists appears to be what led him to deserve the Gold Glove award. In this case, unlike in 1999, it appears that the managers and coaches may have been justified in their choices. Jeter was quite deserving of the award, and though he was probably not the only player who was, there can only be one winner.

The next question that needs answering then becomes: what about the four other players that Perchick suggested in his article? Once again, those players were Alexei Ramirez of the Chicago White Sox, Cliff Pennington of the Oakland Athletics, and Alex Gonzales of the Toronto Blue Jays[9]. If those players truly were deserving of a Gold Glove award, then their z-scores should be at least .85. Ramirez's score for that year was 32 points, corresponding to a z-score of .31. Pennington's score for that year was 28, corresponding to a z-score of -.32. Gonzalez's score for that year was 32 points, which corresponds to a z-score of .31. Thus, none of the players Perchick selected for the award would actually have deserved it based on this system of scoring. In fact, the only other player from that year who was deserving of Gold Glove consideration was César Izturis, the shortstop for the Baltimore Orioles, who received 37 points, corresponding to a z-score of 1.09. This analysis can be carried out for all other years in the dataset as necessary.

Now that the two controversial cases discussed earlier have been addressed, this analysis can be carried out over both entire sets of calculated scores. It is quite possible that there were other years in which an undeserving player was recognized for being a great fielder by being awarded a Gold Glove award. It is also possible that great players who were deserving of the

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[8] Michael Perchick, "Derek Jeter Becomes Latest Undeserving Player to Win Gold Glove," *Bleacher Report,* last modified November 12, 2010, http://bleacherreport.com/articles/515657-derek-jeter-becomes-latest-undeserving-player-to-win-gold-glove

[9] Ibid.

award were overlooked. To check that, the z-scores for each player in every year were calculated. In both datasets, a minimum z-score of .85 is required for a player to be considered deserving of the Gold Glove award in that year. If no player in a certain year deserves the award, then the player or players with the highest point score will be considered to be deserving of the Gold Glove by default, for being objectively the best player(s) in that year.

With the z-scores calculated, a two reference tables were created to show whether the player who won the Gold Glove in each year at first base or shortstop was deserving of the votes from the managers and coaches. Also in these tables are other players who were also considered deserving of votes based on their z-scores and could have also won the Gold Glove award at their respective positions that year. Those tables are as follows:

First Base Gold Glove Winners[10] and Other Deserving Players

Year	Gold Glove Winning Player	Team	Deserving of Gold Glove votes (Y/N)?	Other possible deserving players [Team]
1989	Don Mattingly	NYY	N	George Brett [KC], Wally Joyner [CAL (LAA)]
1990	Mark McGwire	OAK	Y	Kent Hrbek [MIN], Fred McGriff [TOR], Greg Brock [MIN]
1991	Don Mattingly	NYY	N	Mark McGwire [OAK], Pete O'Brien [SEA], John Olerud [TR]
1992	Don Mattingly	NYY	Y	Rafael Palmeiro [TEX]
1993	Don Mattingly	NYY	Y	Rafael Palmeiro [TEX]
1994	Don Mattingly	NYY	N	Rafael Palmeiro [BAL]
1995	J.T. Snow	CAL (LAA)	N	Rafael Palmeiro [BAL], Wally Joyner [KC], John Olerud [TOR]
1996	J.T. Snow	CAL (LAA)	N	Rafael Palmeiro [BAL], Tino Martinez [NYY], Will Clark [TEX]
1997	Rafael Palmeiro	BAL	N	Jeff King [KC]
1998	Rafael Palmeiro	BAL	Y	David Segui [SEA]
1999	Rafael Palmeiro	TEX	N	Christian Guzmán [MIN], Tino Martinez [NYY]
2000	John Olerud	SEA	Y	N/A

[10] "Gold Glove Award for First Basemen," *Baseball Almanac,* accessed March 15, 2016, http://www.baseball-almanac.com/awards/aw_gg1b.shtml

2001	Doug Mientkiewicz	MIN	Y	Tino Martinez [NYY]
2002	John Olerud	SEA	Y	N/A
2003	John Olerud	SEA	Y	Travis Lee [TBD (TB)], Paul Konerko [CWS]
2004	Darin Erstad	ANA (LAA)	N	John Olerud [SEA]
2005	Mark Teixeira	TEX	Y	N/A

Shortstop Gold Glove Winners[11] and Other Deserving Players

Year	**Gold Glove Winning Player**	**Team**	**Deserving of Gold Glove votes (Y/N)?**	**Other possible deserving players [Team]**
1996	Omar Vizquel	CLE	N	Cal Ripken, Jr. [BAL], Ozzie Guillen [CWS], David Howard [KC], Kevin Elster [TEX]
1997	Omar Vizquel	CLE	Y	Jay Bell [KC]
1998	Omar Vizquel	CLE	Y	Mike Bordick [BAL], Derek Jeter [NYY], Deivi Cruz [DET]
1999	Omar Vizquel	CLE	N	Mike Bordick [BAL], Deivi Cruz [DET], Rey Sanchez [KC]
2000	Omar Vizquel	CLE	Y	Deivi Cruz [DET], Rey Sanchez [KC], Alex Rodriguez [SEA]
2001	Omar Vizquel	CLE	Y	Alex Gonzales [TOR], Royce Clayton [CWS], Rey Sanchez [KC], Miguel Tejada [OAK]

[11] Gold Glove Shortstops," *Baseball Almanac,* accessed March 15, 2016, http://www.baseball-almanac.com/awards/aw_ggss.shtml

2002	Alex Rodriguez	TEX	Y	Mike Bordick [BAL], Royce Clayton [CWS], Omar Vizquel [CLE]
2003	Alex Rodriguez	TEX	Y	N/A
2004	Derek Jeter	NYY	N	Omar Vizquel [CLE], Christian Guzmán [MIN], David Eckstein [ANA (LAA)]
2005	Derek Jeter	NYY	Y	Orlando Cabrera [LAA]
2006	Derek Jeter	NYY	N	Alex Gonzales [BOS], Michael Young [TEX]
2007	Orlando Cabrera	LAA	Y	Juan Uribe [CWS]
2008	Michael Young	TEX	Y	Jhonny Peralta [CLE]
2009	Derek Jeter	NYY	Y	César Izturis [BAL], Marco Scutaro [TOR], Erick Aybar [LAA]
2010	Derek Jeter	NYY	Y	César Izturis [BAL]
2011	Erick Aybar	LAA	N	J.J. Hardy [BAL], Jhonny Peralta [DET]
2012	J.J. Hardy	BAL	Y	Jhonny Peralta [DET], Brendan Ryan [SEA]
2013	J.J. Hardy	BAL	N	Yunel Escobar [TB], Jhonny Peralta [DET], Pedro Florimon [MIN]
2014	J.J. Hardy	BAL	N	Erick Aybar [LAA]

In the case of the first basemen, the managers and coaches votes correctly chose a Gold Glove deserving player roughly 53% of the time. In the case of the shortstops, the managers and

coaches correctly chose a Gold Glove deserving player roughly 63% of the time. All things considered, it appears their votes were right more often than not. However, using this system, they would have been able to see that some of the players they chose were the wrong choices before submitting votes. In those cases, perhaps this scoring system would have assisted them in correctly selecting players for whom to cast their votes.

Possible Sources of Error

Though many things in baseball can be quantified, it is difficult for statistics to describe the whole game. While this type of analysis may be helpful for managers and coaches in selecting Gold Glove candidates and casting their votes correctly, there is a possibility for error.

One of the possible sources of error is in considering a range of years instead of analyzing each year individually. On one hand, it makes sense that the Gold Glove should be awarded to the best fielding player in a particular year. Theoretically, past years should not come into play, and therefore should not be considered in the analysis. However, managers and coaches are not blind to the past. Many of them have likely seen the players on the Gold Glove ballots before and remember them from past years. This was cited as a possible reason for Palmeiro's Gold Glove win in 1999. Palmeiro himself said that he felt his established career was what earned him the managers' and coaches' respect and ultimately the Gold Glove that year[12]. Because managers and coaches are bound to regard the past, whether it is consciously or unconsciously, this analysis regarded the data from the past in deciding which players deserved

[12] Associated Press, "Controversy surrounds A.L.'s Gold Glove awards," *Moscow-Pullman Daily News* (Moscow, ID and Pullman, WA), November 10, 1999, url: https://news.google.com/newspapers?nid=2026&dat=19991110&id=M70jAAAAIBAJ&sjid=uNAFAAAAIBAJ&pg=1444,2336696&hl=en

Gold Glove awards. In a perfect situation, this would be unnecessary, but was done because of the imperfections in how managers and coaches asses players' abilities.

Another possible source of error comes from an aspect of the game of baseball that is difficult to quantify. Sometimes during games, fantastic plays are made that are outside of the expected gameplay. Players throw themselves into the crowd, make diving or leaping catches, catch with their bare hands, throw unbelievable distances, and throw from strange positions, all in the name of making outs. Unfortunately, analyzing players purely based on numerical data does not account for plays of this sort. It is almost impossible to put a value on a player saving a game by catching a home run over the fence. Managers and coaches, however, see players who make plays like this and can remember them. This might affect their voting for the Gold Glove award, as it is an award for fielding prowess. Perhaps the players who make many fantastic plays deserve consideration for the Gold Glove even if they are not quite in the top 20% of players. It is possible that some of the players selected in past years were known for plays of this sort and were voted on partially for that reason.

Conclusion

It is difficult for managers and coaches to select the best fielding player at a position every year. This means that even though a player wins a Gold Glove at his position, he is not necessarily the best fielder at that position. He may not even deserve the award at all. Rawlings' newer qualifications will help eliminate some controversies like the case of Rafael Palmeiro in 1999, but there is still bound to be some argument over who should have won a particular position's Gold Glove. The system developed in this paper has the goal of providing managers and coaches an easier way to decide who deserves their votes, rather than relying on their

memories and instincts. While it is not a flawless system, and it does not account for every possible fielding statistic, it is one possible way to assist managers and coaches in the Gold Glove voting process.

Appendix A[13]

Fielding Percentage (American League Starting First Basemen by Team 1989-2005)

	BAL	BOS	CWS	CLE	DET	KC	LAA†	MIN
1989	0.995	0.996	*	0.994	0.993	0.998	0.997	*
1990	0.99	0.987	*	*	0.989	0.993	*	0.997
1991	0.99	0.993	*	*	0.993	*	0.994	0.994
1992	0.994	*	0.992	0.993	0.991	0.993	*	0.997
1993	0.996	0.987	0.989	0.995	0.991	0.994	0.995	0.995
1994	0.996	0.989	0.991	*	0.993	0.991	*	*
1995	0.997	0.992	*	*	*	0.998	0.997	*
1996	0.995	0.988	0.992	*	*	*	0.993	0.994
1997	0.993	0.988	0.986	0.993	0.993	0.996	0.99	*
1998	0.994	0.991	*	0.991	0.991	0.995	*	*
1999	0.993	0.988	*	0.994	0.992	*	*	0.997
2000	0.991	*	0.991	0.995	*	0.991	0.99	0.995
2001	*	0.988	0.994	0.992	*	0.989	*	0.997
2002	0.99	*	0.993	0.991	0.996	0.991	0.997	0.996
2003	0.992	0.996	0.998	0.991	0.99	*	*	0.997
2004	0.993	*	0.995	0.994	0.995	*	0.996	0.994
2005	*	0.992	0.996	0.992	*	*	0.997	0.994

	NYY	OAK	SEA	TB‡	TEX	TOR	MIL
1989	0.995	0.995	0.992	***	0.991	0.989	*
1990	*	0.997	*	***	0.995	0.996	0.995
1991	0.996	0.997	0.997	***	0.992	0.996	*
1992	0.997	0.995	*	***	0.995	0.994	*
1993	0.998	*	0.997	***	0.997	0.992	0.992
1994	*	*	*	***	0.99	0.993	*
1995	0.994	*	0.993	***	0.994	0.997	*
1996	0.996	0.99	0.99	***	0.996	*	*
1997	0.994	0.995	0.996	***	0.996	0.988	*
1998	0.992	0.99	0.999	0.995	0.989	0.992	**
1999	0.995	0.995	*	0.989	0.994	0.99	**
2000	0.994	0.995	0.996	0.993	0.995	0.991	**
2001	0.996	0.992	0.993	*	0.992	0.994	**
2002	*	*	0.996	0.993	*	0.991	**
2003	*	0.992	0.998	0.998	0.996	0.993	**
2004	*	0.993	0.998	0.997	0.992	0.996	**
2005	*	0.994	0.995	0.996	0.998	*	**

[13] *Baseball-Reference*, accessed March 15, 2016, http://www.baseball-reference.com.

Fielding Percentage (American League Starting Shortstops by Team 1996-2014)

	BAL	BOS	NYY	TB‡	TOR	CWS	CLE	DET
1996	0.98	0.971	0.969	*	0.973	0.981	0.971	*
1997	0.98	0.971	0.975	*	0.986	0.974	0.985	0.979
1998	0.99	0.962	0.986	0.979	0.976	0.944	0.993	0.983
1999	0.989	0.972	0.978	*	0.976	0.957	0.976	0.983
2000	0.975	0.971	0.961	0.976	0.975	0.95	0.995	0.982
2001	*	*	0.974	0.944	0.987	0.988	0.989	0.964
2002	0.998	0.965	0.977	0.98	*	0.989	0.99	*
2003	0.975	0.971	0.968	0.969	0.964	0.969	*	*
2004	0.97	*	0.981	0.963	*	0.965	0.982	0.974
2005	0.971	0.954	0.979	0.968	0.952	0.977	0.97	*
2006	0.972	0.985	0.975	*	*	0.977	0.977	0.956
2007	0.971	0.968	0.97	*	*	0.976	0.974	0.955
2008	*	*	0.979	0.97	*	0.978	0.979	0.972
2009	0.984	*	0.986	0.962	0.984	0.969	*	0.969
2010	0.985	0.965	0.989	0.977	0.973	0.974	*	*
2011	0.99	0.972	0.972	*	0.974	0.977	0.976	0.988
2012	0.992	0.975	0.98	*	0.982	0.982	0.971	0.988
2013	0.981	0.984	*	0.989	*	0.968	0.982	0.991
2014	0.978	*	0.973	0.965	0.965	0.978	*	*

	KC	MIN	LAA†	OAK	SEA	TEX	MIL	HOU
1996	0.982	0.965	0.971	0.979	0.977	0.981	0.95	**
1997	0.985	0.969	0.977	*	0.962	0.963	0.967	**
1998	*	0.966	0.98	0.951	0.975	*	**	**
1999	0.982	0.959	*	0.973	0.977	0.961	**	**
2000	0.994	0.967	*	0.972	0.986	0.977	**	**
2001	0.991	0.959	0.971	0.973	0.98	0.976	**	**
2002	0.972	0.981	0.977	0.975	0.966	0.987	**	**
2003	0.968	0.98	0.984	0.972	*	0.989	**	**
2004	0.955	0.983	0.988	0.975	*	0.972	**	**
2005	0.965	*	0.988	*	*	0.974	**	**
2006	0.969	*	0.975	*	0.971	0.981	**	**
2007	0.966	0.96	0.983	*	0.967	0.972	**	**
2008	*	*	*	0.972	0.968	0.984	**	**
2009	*	*	0.983	0.965	*	0.968	**	**
2010	0.974	*	0.963	0.966	*	0.976	**	**
2011	0.98	*	0.98	0.964	0.974	0.963	**	**
2012	0.972	*	0.975	*	0.985	0.976	**	**
2013	0.979	0.992	0.973	0.962	*	0.976	**	*
2014	0.976	0.98	0.982	0.974	0.958	0.971	**	*

Appendix B[14]

Number of Assists Made (American League Starting First Basemen by Team 1989-2005)

	BAL	BOS	CWS	CLE	DET	KC	LAA†	MIN
1989	83	107	*	114	85	80	99	*
1990	87	137	*	*	111	66	*	81
1991	81	101	*	*	83	*	98	95
1992	76	*	92	78	92	137	*	68
1993	98	70	83	86	78	145	81	81
1994	66	57	45	*	108	64	*	*
1995	119	95	*	*	*	118	57	*
1996	119	74	85	*	*	*	103	92
1997	112	75	49	95	100	147	64	*
1998	124	90	*	85	102	85	*	*
1999	52	60	*	83	85	*	*	50
2000	71	*	67	91	*	88	69	67
2001	*	75	90	78	*	88	*	69
2002	58	*	75	75	71	105	59	69
2003	80	81	80	63	91	*	*	68
2004	95	*	78	77	77	*	66	62
2005	*	85	82	60	*	*	79	91

	NYY	OAK	SEA	TB‡	TEX	TOR	MIL
1989	87	114	81	***	119	115	*
1990	*	95	*	***	91	126	63
1991	77	101	86	***	96	78	*
1992	116	71	*	***	143	81	*
1993	84	*	60	***	147	97	128
1994	*	*	*	***	73	68	*
1995	81	*	101	***	88	89	*
1996	83	60	81	***	73	*	*
1997	105	94	86	***	62	67	*
1998	93	73	116	81	73	87	**
1999	106	45	*	88	60	84	**
2000	88	59	132	82	56	82	**
2001	99	76	121	*	83	103	**
2002	*	*	101	85	*	95	**
2003	*	81	125	100	71	103	**
2004	*	86	77	67	98	88	**
2005	*	57	120	67	101	*	**

[14] Ibid.

Number of Assists Made (American League Starting Shortstops by Team 1996-2014)

	BAL	BOS	NYY	TB‡	TOR	CWS	CLE	DET
1996	467	347	444	*	465	348	447	*
1997	424	450	457	*	341	348	429	420
1998	446	402	393	335	427	378	442	445
1999	511	357	391	*	438	348	396	453
2000	398	402	349	368	407	456	414	482
2001	*	*	343	148	509	367	414	292
2002	372	467	367	356	*	292	431	*
2003	409	456	271	391	300	396	*	*
2004	526	*	392	422	*	373	396	418
2005	479	419	454	424	326	422	413	*
2006	418	305	381	*	*	373	459	428
2007	358	360	390	*	*	443	452	352
2008	*	*	347	309	*	472	427	365
2009	337	*	340	339	421	410	*	282
2010	382	344	365	309	486	499	*	*
2011	403	269	280	*	343	457	386	383
2012	529	369	324	*	431	434	408	359
2013	403	332	*	395	*	433	314	294
2014	394	*	256	267	371	486	*	*

	KC	MIN	LAA†	OAK	SEA	TEX	MIL	HOU
1996	401	344	460	476	404	441	460	**
1997	443	415	421	*	394	328	383	**
1998	*	412	437	327	445	*	**	**
1999	452	363	*	471	382	406	**	**
2000	446	413	*	501	438	411	**	**
2001	479	327	332	473	313	452	**	**
2002	400	360	397	504	304	472	**	**
2003	473	352	293	490	*	464	**	**
2004	389	440	309	505	*	423	**	**
2005	441	*	347	*	*	427	**	**
2006	366	*	377	*	430	492	**	**
2007	438	415	415	*	435	446	**	**
2008	*	*	*	383	401	465	**	**
2009	*	*	378	428	*	407	**	**
2010	418	*	344	496	*	401	**	**
2011	459	*	406	374	371	407	**	**
2012	408	*	359	*	396	414	**	**
2013	395	461	328	266	*	362	**	*
2014	440	475	359	344	267	371	**	*

Appendix C[15]

Number of Errors Made (American League Starting First Basemen by Team 1989-2005)

	BAL	BOS	CWS	CLE	DET	KC	LAA†	MIN
1989	5	6	*	9	7	2	4	*
1990	9	17	*	*	14	7	*	3
1991	10	8	*	*	8	*	8	8
1992	7	*	13	8	10	10	*	3
1993	5	16	15	6	10	7	6	5
1994	4	10	7	*	7	8	*	*
1995	4	11	*	*	*	3	4	*
1996	8	15	9	*	*	*	10	5
1997	10	14	11	10	10	5	11	*
1998	9	12	*	10	13	5	*	*
1999	6	11	*	6	10	*	*	5
2000	9	*	10	5	*	9	14	3
2001	*	11	8	10	*	12	*	4
2002	10	*	8	10	4	9	3	5
2003	9	4	2	9	13	*	*	4
2004	8	*	6	6	6	*	4	5
2005	*	7	5	9	*	*	4	8

	NYY	OAK	SEA	TB‡	TEX	TOR	MIL
1989	7	6	10	***	12	17	*
1990	*	5	*	***	7	6	5
1991	5	4	3	***	12	5	*
1992	4	6	*	***	7	7	*
1993	3	*	3	***	5	10	10
1994	*	*	*	***	10	6	*
1995	7	*	8	***	7	4	*
1996	5	10	11	***	4	*	*
1997	8	7	4	***	4	12	*
1998	10	14	1	6	13	10	**
1999	7	7	*	13	8	14	**
2000	7	6	5	10	4	13	**
2001	5	11	9	*	8	9	**
2002	*	*	5	7	*	12	**
2003	*	10	3	3	4	10	**
2004	*	10	2	3	10	5	**
2005	*	6	7	4	3	*	**

[15] Ibid.

Number of Errors Made (American League Starting Shortstops by Team 1996-2014)

	BAL	BOS	NYY	TB‡	TOR	CWS	CLE	DET
1996	14	16	22	*	21	11	20	*
1997	13	21	18	*	8	15	10	13
1998	7	25	9	11	17	35	5	11
1999	9	17	14	*	16	24	15	12
2000	16	18	24	14	16	36	3	13
2001	*	*	15	15	10	7	7	17
2002	1	25	14	12	*	5	7	*
2003	16	20	14	20	17	20	*	*
2004	24		13	25	*	20	11	17
2005	22	11	15	24	26	16	19	*
2006	19	7	15	*	*	14	16	28
2007	15	19	18	*	*	17	19	24
2008	*	*	12	16	*	16	14	16
2009	8	*	8	20	10	20	*	14
2010	9	18	6	11	*	20	*	*
2011	6	12	12	*	14	16	15	7
2012	6	15	10	*	12	12	19	7
2013	12	8	*	7	*	22	9	4
2014	13	*	11	16	19	15	*	*

	KC	MIN	LAA†	OAK	SEA	TEX	MIL	HOU
1996	11	22	20	16	15	14	37	**
1997	10	20	15	*	24	19	20	**
1998	*	24	14	26	18	*	**	**
1999	13	24	*	21	14	25	**	**
2000	4	22	*	21	10	16	**	**
2001	6	21	15	20	10	18	**	**
2002	19	12	14	19	18	10	**	**
2003	24	11	8	21	*	8	**	**
2004	28	12	6	19	*	19	**	**
2005	25	*	7	*	*	18	**	**
2006	18	*	16	*	20	14	**	**
2007	23	26	11	*	23	19	**	**
2008	*	*	*	17	21	11	**	**
2009	*	*	11	25	*	22	**	**
2010	18	*	21	25	*	16	**	**
2011	15	*	13	22	15	25	**	**
2012	19	*	15	*	9	16	**	**
2013	13	6	15	16	*	14	**	*
2014	16	15	10	13	18	18	**	*

*Indicates a year where the starting player was disqualified
**Indicates a year where the team was not part of the American League
***Indicates a year where the team did not exist in Major League Baseball
† Previously TBD
‡Previously CAL and AHA

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