On the Importance of Throwing Strikes

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Overview

We all know that pitchers need to throw strikes in order to be successful. However, how important is it, really, to throw a first pitch strike? Which is the most important count on which to throw a strike? By how much does throwing a ball increase the chance batters will reach base? Is the pitcher in a better situation on 1-1 or 2-2?

In this paper, based on four years of Stanford pitching/hitting data (over 76,000 pitches and 20,000 plate appearances) and Competitive Edge Decision Systems' ChartMine™ software, we begin to address these questions.[1]

CountValue™

Before we can examine the importance of throwing strikes, we need to understand the value of each count. For example, it is clear that from the pitcher's perspective that 0-1 is a better count than 1-0, but how much better is it? Twice as good? How much better is 0-2 than 3-0?

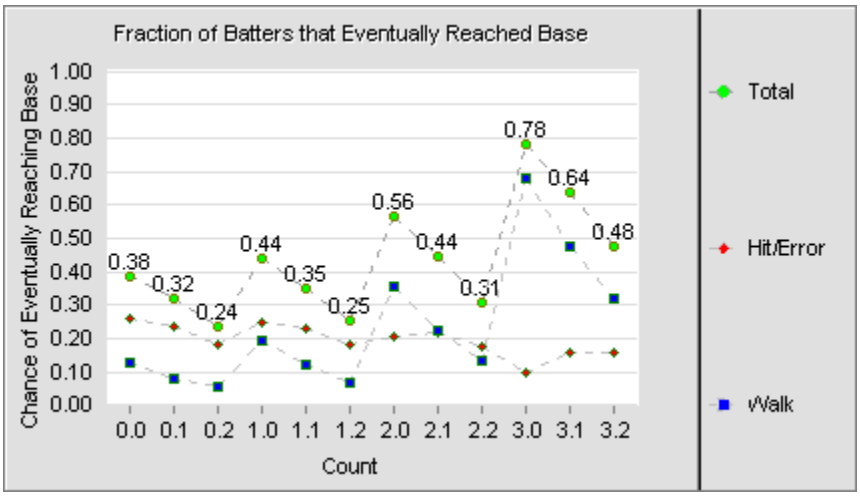
Competitive Edge Decision Systems' CountValue statistic can answer these questions. CountValue calculates the fraction of batters that had a particular count and **eventually** reached base.[2] For example, we can determine what fraction of all the batters that had an 0-0 count eventually reached base. Likewise, we can calculate what fraction of batters that had an 0-2 count eventually reached base. Some of these batters may have reached on the 0-2 count or some many have gone 1-2, 2-2, 3-2, and then reached base. The important point is that we are calculating the fraction of batters that **eventually** reach given they had a particular count.

Figure 1 illustrates the fraction of batters that eventually reached base for each count, based on our Stanford data set.

[1] Stanford has been using ChartMine since 1998.

[2] CountValue can also determine the average number of bases eventually given up.

Figure 1: Chance of Eventually Reaching Base Given the Batter has a Particular Count



The square data points represent the batters that eventually reached via a walk. The diamond data points are the batters that eventually reached via a hit or error. The top series of data (circles) represents the fraction of batters that reached by a walk, hit, or error—the total fraction that eventually reached base.

For example, 38% of all batters that had an 0-0 count eventually reached base. Since every batter starts with an 0-0 count, this is the same as saying 38% of all batters reach base. Conversely, 78% of all batters that had a 3-0 count eventually reached base. Of these, 10% eventually reached via a hit/error and 68% eventually walked. Notice that the chance of eventually reaching base via a hit/error does not change dramatically throughout a plate appearance (there is a slight drop off with 3 balls). What does change dramatically is the chance of eventually walking. **Walks are the major driver of batters reaching base**. This is a great story to tell your pitchers and supports that old baseball adage that "good pitching beats good hitting." Good pitching, in the sense of control pitching, greatly reduces the chance that batters will reach base.

The chance of eventually reaching base if the batter gets to the 1-0, 2-0, 2-1, 3-0, 3-1, and 3-2 counts is greater than 0-0. In other words, the pitcher is in a worse position on these counts than he was on 0-0. The pitcher has gained ground on 0-1, 0-2, 1-1, 1-2, and 2-2. To answer one of our initial questions, the pitcher is better off on 2-2 than he is on 1-1.

The Value of Throwing Strikes

By throwing a strike we mean any pitch that is either recorded as a true strike (swung at and missed, taken for a strike, or fouled off with less than two strikes)[3], fouled off with two strikes, or is put into play by the batter. This includes pitches outside of the strike zone swung at by the batter.

To begin to understand the value of throwing a strike, let's start with the 0-0 count. If you throw a ball on 0-0, the count will go 1-0. From Figure 1, we know that 44% of all batters that had a 1-0 count eventually reached base--a 6% increase over 0-0. In other words, throwing a ball on the first pitch increases the chance the batter will reach base by 6%.

What are the possible outcomes if you throw a strike? The batter will either take it for a strike, swing and miss, foul it off, or put the ball in play. If the batter does any of the first three, the count will go 0-1 and, based on Figure 1, the

[3] Of course, a bunt foul with two strikes is also a true strike.

chance of eventually reaching base if the batter has an 0-1 count is 32%. This is a 6% decrease over 0-0 and a 12% spread (44% - 32%) versus an 0-0 ball. However, the risk of throwing a strike is that the batter may put the ball in play. Therefore, we also need to know how likely batters are to put the ball in play if they are thrown a strike and how likely they are to reach base if they put the ball in play.

ChartMine's InPlay AVG™ and HandleIT™ statistics give us this information. InPlay AVG looks at all the balls that were put in play and determines in what fraction of the time the batter reached base. Table 1 details these numbers for each count, based on the Stanford database.

Table 1: Chance of Reaching Base if the Ball is Put in Play

Count	Probability of Reaching if Ball is Put in Play
0-0	37%
0-1	38%
0-2	36%
1-0	38%
1-1	36%
1-2	36%
2-0	39%
2-1	37%
2-2	35%
3-0	38%
3-1	39%
3-2	36%

We see from Table 1 that there is a 37% chance the batter will reach base if he puts the ball in play on 0-0 (33% chance of a hit and a 4% of an error).[4] Therefore, the spread between throwing a ball or a strike on 0-0 is between 7% (44% - 37%) and 12% (44% - 32%). The actual spread depends on how likely the batter is to put the ball in play if you throw a strike on 0-0.

ChartMine's HandleIT statistic looks at every pitch thrown for a strike and determines what fraction of those pitches were taken, swung at and missed, fouled off, put in play for an out, put in play for a hit, or put in play for an error. Based on four years of Stanford data, Table 2 presents the chance the batter will put the ball in play if you throw him a strike, for each count.

[4] Please see our paper entitled "To Take or Not to Take: That is the Question" for a complete discussion of the chance of reaching base if the ball is put in play.

Table 2: Chance the Batter will put a Strike in Play

Count	Probability a Strike will be Put into Play
0-0	24%
0-1	32%
0-2	34%
1-0	30%
1-1	34%
1-2	39%
2-0	27%
2-1	36%
2-2	38%
3-0	6%
3-1	33%
3-2	42%

We see from Table 2 that there is a 24% chance the batter will put an 0-0 strike in play. The remaining 76% will either be taken, swung at and missed, or fouled off (surprisingly, 50% of all 0-0 strikes are simply taken).

Now we have all the information that we need! If you throw the batter a strike on 0-0 there is a 76% chance the count will go 0-1, in which case there is a 32% he will eventually reach base. Conversely, there is a 24% chance the batter will put the ball in play, in which case there is a 37% he will reach base. Therefore, the chance the batter will reach base if you throw him a strike on 0-0 is 33% (0.76 x 32% + 0.24 x 37%). This is a 5% decrease compared to 0-0. This is not quite as good as the 6% decrease we get from going 0-1 because of the fact that the batter may get a hit if you throw him a strike.

Back to our question—how valuable is an 0-0 strike? Recall, 44% of all batters that had a 1-0 count eventually reached base. Therefore, the spread between throwing a ball or a strike on 0-0 is 11% (44% - 33%). That is, throwing an 0-0 strike reduces the chance the batter will reach base by 11%, compared to throwing him a ball.

How important is an 0-0 strike? Let's assume that you face 40 batters per game.[5] Always throwing a strike on 0-0, versus a ball, saves you 4.4 base runners per game. How is that for an incentive? This really reduces the benefit of throwing strikes to a number your pitchers can understand. Throwing first pitch strikes can help keep almost 5 extra runners off base per game. Recall, batters simply take the first pitch for a strike 50% of the time and foul it off or swing and miss 26% of the time.

We can perform the analysis we just detailed for every count to obtain the benefit of throwing strikes for each count.[6]

[5] This is reasonable based on Stanford's database.

[6] On the two strike counts, you must account for the fact that a foul does not change the count.

Table 3: Value of Throwing a Strike for Each Count

Count	Chance Batter will Eventually Reach Base if a Ball is Thrown	Chance Batter will Eventually Reach Base if a Strike is Thrown	Spread	Plate Appearances per Game	Baserunners Saved per Game[7]
0-0	0.44	0.33	0.11	40.0	4.3
0-1	0.35	0.28	0.07	17.0	1.1
0-2	0.25	0.19	0.06	7.5	0.4
1-0	0.56	0.36	0.20	17.4	3.5
1-1	0.44	0.29	0.15	15.0	2.3
1-2	0.31	0.21	0.10	11.9	1.2
2-0	0.78	0.43	0.35	6.8	2.4
2-1	0.64	0.33	0.31	9.0	2.8
2-2	0.48	0.23	0.25	10.4	2.6
3-0	1	0.62	0.38	2.4	0.9
3-1	1	0.45	0.55	4.4	2.4
3-2	1	0.31	0.69	7.1	4.9

From Table 3, we see that the greatest benefit from throwing strikes comes on the 3-2 count. Throwing a strike on 3-2 decreases the chance of reaching base by 69% compared to throwing a ball. This may be somewhat surprising, but the result is intuitive. Throwing a ball puts the runner on base. However, this fact is true of all the 3 ball counts. The difference on 3-2 is that a strike may result in a strike out (In fact, 25% of all 3-2 strikes are taken or swung at and missed.). Since 7.1 batters face the 3-2 count per game, on average, throwing a strike in this situation could save you 4.9 runners per game. The risk of throwing a strike (that the batter may get a hit) is offset by the fact that he may strike out.

The count with the lowest spread is, not surprisingly, 0-2. Throwing a strike on 0-2 reduces the chance the batter will reach base by 6%, which translates into less than one runner per game—on average.

Another count that does not save a lot of baserunners is 3-0. The spread on 3-0 is quite large—38%. So, it is important to throw a strike if you are in this situation. However, only 2.4 batters per game have a 3-0 count.

The previous analysis was based on the objective of minimizing the number of runners that reach base. Therefore, it gave equal weight to singles, doubles, triples, and homeruns. Might our conclusions change if we take into account the quality of the hit, measured by the number of bases obtained? We won't go through this analysis here, in the interest of space. Suffice it to say that we repeat the analysis that we just went through, but instead of calculating the chance of reaching base, we also account for how many bases the batter obtains when he does reach base. Table 4 presents the results of this analysis.

[7] Note, you cannot add up the baesrunners saved for each count to get a total for a game because throwing strikes will change the number of batters that face a particular count.

Table 4: Value of Throwing a Strike for Each Count Based on Average Bases

Count	Avg Bases Eventually Obtained if a Ball is Thrown	Avg Bases Eventually Obtained if a Strike is Thrown	Spread	Plate Appearances per Game	Bases Saved per Game
0-0	0.58	0.44	0.14	40.0	5.6
0-1	0.46	0.37	0.37	17.0	1.6
0-2	0.33	0.25	0.08	7.5	0.6
1-0	0.69	0.47	0.22	17.4	3.8
1-1	0.56	0.37	0.19	15.0	2.8
1-2	0.40	0.26	0.14	11.9	1.7
2-0	0.85	0.55	0.30	6.8	2.0
2-1	0.73	0.43	0.30	9.0	2.7
2-2	0.58	0.29	0.29	10.4	3.0
3-0	1	0.72	0.28	2.4	0.7
3-1	1	0.55	0.45	4.4	2.0
3-2	1	0.39	0.61	7.1	4.3

In this case, we again see that the greatest benefit from throwing strikes comes on the 3-2 count—based on the spread. Throwing a strike on 3-2 decreases the average number of bases obtained by 0.61, compared to throwing a ball. Since 7.1 batters face the 3-2 count per game, on average, throwing a strike in this situation could save you 4.3 bases per game.

Throwing strikes on the 0-0 count could save you 5.6 bases per game!

Conclusion

Throwing strikes is important. Competitive Edge Decision Systems' CountValue is the first statistic to reveal just how important. For example, in this paper we have demonstrated that walks are the primary determinate of whether or not batters reach base—the chance of a hit/error does not change appreciably throughout a plate appearance. In addition, we have been able to determine how much throwing strikes helps the pitcher. For example, throwing strikes on 0-0 could keep 4.3 runners off base per game (or 5.6 bases). This is a great story to tell your pitchers.

The analysis presented in this paper was averaged over all players and pitchers spanning a four-year time frame. Results for particular pitchers and hitters may vary. You will have to start using ChartMine to find out by how much!
