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On the Decision to Take a Pitch

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Baseball is a highly strategic game, with decisions being made almost continuously. In this paper, we analyze the decision to have the batter take a pitch, which means that he does not swing at the pitch under any circumstances—even if it is easily hittable. Why would a batter do this? Using decision-theoretic reasoning, we determine under what circumstances such a decision is good. We find that in some cases, taking pitches deterministically dominates not taking.

Key words: decision analysis applications; baseball strategy; decision analysis education
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1. Introduction

Roger Kahn (2000) beautifully described baseball as "chess at 90 miles per hour." Decisions are made quickly and continuously. Before the game begins, the manager must choose his batting order, which cannot be changed for the remainder of the game except when making substitutions. With each pitch, the defensive team must decide how to position its players, whether to intentionally walk the current batter, and what pitch to throw. The offensive team must decide whether to steal a base, attempt a hit and run, and whether to "take" a pitch, which means the batter simply does not swing—no matter how good the pitch is.

1.1. Baseball Primer

We begin with a short, and necessarily incomplete, review of some baseball terminology and details that facilitate understanding of what follows.

The Teams. The offensive team is the team at bat. Its objective is to score runs by converting batters into base runners and then advancing the base runners from first base to second base, to third base, and finally to home plate by putting the ball in play. The defensive team has the ball.[1] If the batter puts the ball in play, he will obtain a *hit*, be put *out*, or reach base via an *error*. An error is a designation given to plays where the batter should have been put out, but reached base because of a mistake in execution by the defense. The defensive team tries to prevent the offensive team from scoring runs. It does this by recording outs, of which each team is allotted three per inning and nine innings total per game.

The Count. A batter's time at bat is called a *plate appearance*. Batters are allowed three strikes before being called out. A *strike* can be obtained in three ways: the batter does not swing and the umpire declares the pitch to have been in the strike zone (i.e., it was hittable), the batter swings and misses, or the batter hits the ball but it does not land within the field of play. The last is called a *foul ball*. Foul balls do not count as strikes if the batter already has two strikes. A *ball* is a non-strike, that is, a pitch that was not swung at by the batter and not declared a strike by the umpire. If a batter receives four balls, which is called a *walk*, his plate appearance ends and he becomes a base runner at first base. The *count* is the number of balls and strikes and is written as *balls-strikes*. For example, 3-2 means the pitcher has thrown 3 balls and the batter has 2 strikes. Any 0 in the count is pronounced "oh."

The Pitches. Pitchers attempt to deceive batters by throwing pitches that vary in speed, location, and movement. Common pitches are the fastball,

[1] The "bat and ball" sports of cricket, baseball, softball, etc. are the only ones where this is the case.

curveball, slider, and changeup.[2] The fastball is the easiest pitch to throw to a particular spot, called *control*, and pitchers thus tend to rely on it when in danger of walking the batter.

The Decision Maker. Each team is directed by a manager, often called a "skipper." The manager is responsible for all decisions made while the ball is not in play. For example, the manager can order a batter not to swing at a particular pitch.

The Strategy. Conventional baseball wisdom is referred to as The Book. According to The Book, taking the 3-0 pitch is nearly automatic, whereas other counts such as 2-0 are taken infrequently. On the other hand, Ted Williams, one of the game's greatest hitters, advanced a strategy of taking the 0-0 count in order to get a "read" on the pitcher (Williams and Underwood 1986). Although rarely seen in the major leagues, at times the manager will order his players to *take a strike*, which means that they should not swing until the pitcher has thrown his first strike. Williams also suggested taking pitches in order to tire the pitcher, a strategy employed recently by the Oakland Athletics (Lewis 2004).

1.2. Taking a Pitch

Why would a batter ever take a pitch? *Especially* on the 3-0 count, when he knows the pitcher is going to try his best to throw a strike, which means a fastball. In fact, in the data set we consider below, pitchers threw fastballs 96% of the time on 3-0 and in 61% of these cases the pitch was a strike. How could a batter let what is likely to be the best pitch he will see during the entire game (i.e., a "fat" fastball right down the middle) simply go by?

Although taking on 3-0 is almost mandatory, one would be hard pressed to find a clear argument as to why this is a sound strategy. In most cases, the argument is that the offensive team should take a pitch because it needs base runners. But, this defines the objective and does nothing to explain how taking a pitch increases the chance of reaching base. In this paper, we formulate the decision to take a pitch and demonstrate under what conditions it is a sound strategy.[3]

2. To Take or Not to Take

How should a manager decide whether to have a batter take a pitch? Let us illustrate by examining a particular count: the 3-0. The manager has two alternatives: (1) have the batter take the 3-0 pitch (Take 3-0) or (2) allow the batter to swing away if he chooses, which we will refer to as Do Not Take. It is important to bear in mind that not taking does not imply that the batter will swing at any pitch, only that the he has the option to swing if he so chooses. The possible outcomes are as follows:

1. If the batter takes the 3-0, either (A) he will walk (if a ball is thrown) or (B) the count will go 3-1 (if a strike is thrown) and the plate appearance will continue.
2. If the batter is permitted to swing, he will either (A) walk, (B) go 3-1 (by taking a strike, swinging and missing, or fouling the pitch off), or (C) put the ball in play.

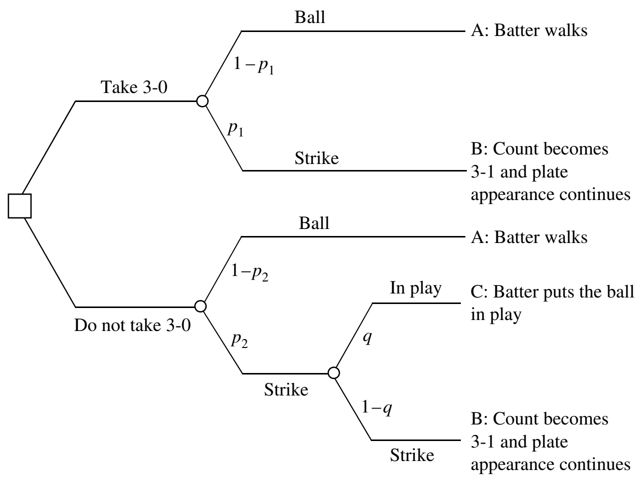
This situation is depicted graphically in the decision tree shown in Figure 1. There is a p_1 chance that the pitcher will throw a strike and therefore a $1-p_1$ chance that he will throw a ball. If the batter is not taking then the probability of a strike is p_2, which must be at least as large as p_1 because it includes the possibility that the batter swings at a bad pitch (i.e., a pitch that would have been a ball if the batter did not swing). We will assume that batters do not swing at bad pitches and therefore that $p_2 = p_1 = p$. As we discuss below, relaxing this assumption only strengthens our conclusions regarding the benefits of taking on some counts.

The distinction between these two alternatives is putting the ball in play on 3-0. If the probability of reaching base is greater in situation B than it is in C then taking will be preferred to not taking. In other words, taking 3-0 will be better than not taking if putting the ball in play on 3-0 is worse than allowing the count to go 3-1 and continuing from this new state. Whether this is the case depends to a large degree on the manager's objectives. The goal is

[2] When asked why he wanted to drop baseball as a varsity sport at Harvard University, President Charles W. Eliot (1834–1926) replied, "Well, this year I'm told the team did well because one pitcher had a fine curve ball. I understand that a curve ball is thrown with a deliberate attempt to deceive. Surely that is not an ability we should want to foster at Harvard" (Dickson 1991).

[3] Bickel and Stotz (2003a, b) discussed this decision in a much less technical setting, based on a smaller data set.

Figure 1 Decision Tree for 3-0 Count



clearly to win, but this objective requires modeling the performance of both teams for the remainder of the game. Markov processes can be used to address this (Howard 1960, 1977; Bickel 2004b), but in this paper we focus on three more immediate objectives: maximizing the chance of reaching base, maximizing the average number of bases obtained, and maximizing the chance of getting a hit. Which strategy a manager should follow depends on the current game situation. For example, early in the game, the offensive team wants to score as many runs as possible and a reasonable proxy for this is to maximize the expected number of bases obtained. Late in the game, down by multiple runs, the offensive team needs base runners and therefore will want to maximize the probability of reaching base (Watts 1964). Once runners are in scoring position, the strategy shifts to driving them in—or maximizing the chance of getting a hit. We will investigate the benefit of taking strikes for all three of these objectives.

To determine the preferred alternative in Figure 1, we must specify how each of the three possible outcomes, A, B, and C, score on our three objectives. Doing so for Walk is straightforward. The probability the batter will reach base if he walks is 1.0 and, likewise, the average number of bases he obtains is 1.0. The probability he will obtain a hit is 0.0. Determining these values for the other two possible outcomes (B and C) is more difficult and is the task to which we now turn.

2.1. Maximizing the Probability of Reaching Base

We obtained data covering 43,926 plate appearances and 161,998 pitches involving Stanford Baseball (pitching and batting) from 1998 to 2006. We captured and analyzed this data using a commercially available pitch/hit charting software program called ChartMine®. Stanford is among the best college baseball teams, and our data set can be viewed as covering the elite teams of collegiate play. Extensions of this work to Major League Baseball are left as future research.

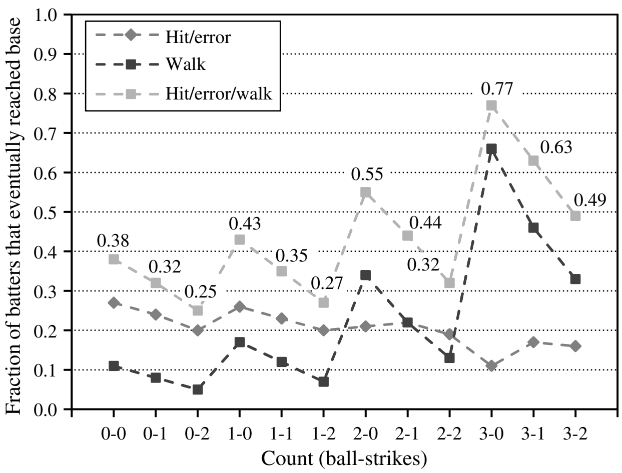
We begin with a caveat. Although we make use of frequency data in this paper, we assume that the manager assigns these frequencies as his probabilities, owing to our large data set. We treat the terms frequency, chance, and probability as synonymous.

Figure 2 displays the fraction of batters that *eventually* reached base via a hit or a walk.[4] For example, 38% of batters that had an 0-0 count (18,986 plate appearances), which is all batters, eventually reached base. If a strike was thrown and the count became 0-1, then 32% of those batters eventually reached base (8,314 plate appearances). Conversely, if the first pitch was a ball and the count became 1-0, then 43% of those batters eventually reached base (16,398 plate appearances). It is interesting that throwing strikes decreases the probability of reaching base in a nearly linear fashion. Also, the fraction eventually reaching base via a hit or an error does not change nearly as dramatically as does the fraction of reaching via a walk. Clearly the probability of a walk dominates the probability of reaching base. Figure 2 provides substance to the famous quote by Pat Moran (1876–1924), manager of the Philadelphia Phillies (1915–1918) and the Cincinnati Reds (1919–1923), who when asked on his deathbed what was killing him replied, "Bases on balls. Bases on balls …."

A possible objection to the data presented in Figure 2 is that the population of batters and hitters changes by count. For example, the set of all batters and pitchers that had a 3-0 count will differ from that of the 0-2. Thus, the probabilities shown in Figure 2 may differ for every pitcher-hitter combination and it is possible that recommendations at the player level

[4] This could also be modeled as a Markov process.

Figure 2 Fraction of Batters That Eventually Reached Base for Each Count



could differ from those in aggregate (i.e., Simpson's paradox).

Although this possibility exists, we assume that the frequencies shown in Figure 2 represent the "true" probability of reaching base for an average hitter and pitcher. This assumption is in the spirit of other applications of statistics and decision-analytic methods to sports. For example, both Lindsey (1963) and Thorn and Palmer (1984) compute the average number of runs scored from any combination of base states (e.g., nobody on, runners on first and third, etc.) and outs or the number of runs scored following a particular type of hit—called *linear weights*. Analysts routinely use these linear weights to value different game situations—even though they are certainly incorrect in any specific situation. Likewise, football analysts have examined the value of different field positions and whether or not one should punt or try for a first down (Carter and Machol 1971, 1977, 1978). These studies use the average number of points scored from any combination of field position, the number of downs, and the time remaining, even though these estimates are certain to be wrong for any particular play.

Our results do not apply in every possible case, but we believe they provide insight into an important aspect of baseball strategy. If one does not accept the results in Figure 2 they could instead analyze more specific situations or directly assess these probabilities from baseball managers. We believe both of these approaches would be challenging. The former will be difficult because of the scarcity of data. For example, over nine seasons and 19,000 plate appearances, only 4,491 occurred on the 3-0 count and in only 147 of these cases did the batter put the ball in play. Direct assessment will present the standard challenges of probability assessment, in addition to the difficulty of finding baseball managers willing to spend their time on such an activity. In sum, we are comfortable with the data presented above and argue below that our results are quite robust.

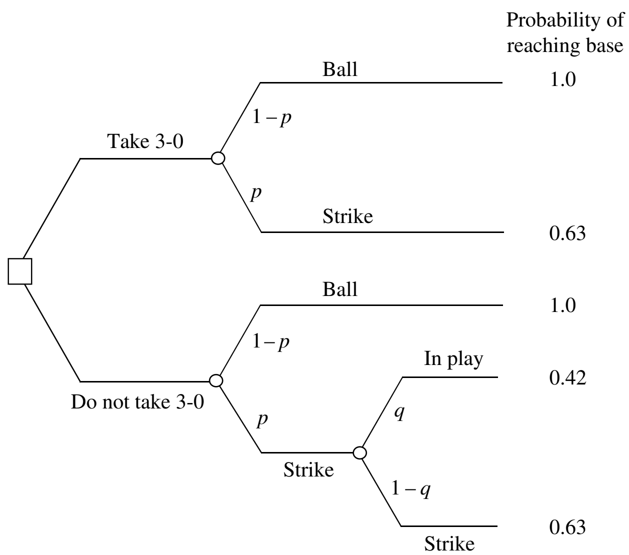
Our objectives of maximizing the probability of reaching base and maximizing the expected number of bases obtained may not be the same as maximizing the expected number of runs, which is closer to, but not the same as, maximizing the probability of winning. One could even argue for the use of linear weights in our current analysis, in an effort to better tie our objectives to run scoring. However, we do not consider the use of linear weights because we are unaware of their development in the area of collegiate baseball.

Returning to the decision to take the 3-0 count. If the batter takes a pitch on 3-0 and this pitch is declared a strike by the umpire, then the count will become 3-1. As shown in Figure 2, over these nine seasons, 63% of batters that had a 3-1 count eventually reached base. However, only 42% of batters that put the ball in play on 3-0 reached base (38% via a hit and 4% via an error). This additional information appears in Figure 3. Notice that as soon as the batter put the ball in play on 3-0, he reduced his chance of reaching base by 21% as compared to taking a strike! *Taking* 3-0 *deterministically dominates not taking*. By taking a pitch the batter is certain to be in a state that is at least as good as not taking and therefore the particular values of p and q are irrelevant. Thus, even knowing what pitch the pitcher is going to throw is of no value. The batter might as well take a seat and let the pitcher try to throw a strike.[5] This result corresponds well with baseball conventional wisdom and practice. In fact, the batters in our data set took 82% of all 3-0 pitches thrown for a strike.

Table 1 is a decision table that details on which counts the batter should take a pitch. The final column

[5] Of course, the batter would like the pitcher to throw a ball. Thus, he does not want the pitcher to feel too comfortable in throwing a strike.

Figure 3 Decision Tree for 3-0 Based on the Probability of Reaching Base



displays how often batters took a strike. In parentheses are the numbers of observations for a particular event.

2-0 and 3-1 are the only other counts where taking a strike increases the chance of getting on base. The batter is more likely to reach base by taking a pitch, even if that pitch turns out to be a strike. Taking a strike on 2-0 increases the chance of reaching base by 7%

Table 1 Decision Table for Taking a Pitch Based on Probability of Reaching Base

Current count	New count if batter takes a strike	Fraction of batters eventually reaching base if a strike is taken (B)	Fraction of batters reaching base if ball is put in play (C)	Difference between C and B (fraction reaching base)	Take a pitch	Fraction of strikes taken
0-0	0-1	0.32 (18,986)	0.36 (5,853)	−0.04	No	0.50
0-1	0-2	0.25 (8,314)	0.37 (3,559)	−0.12	No	0.27
0-2	Strikeout	0	0.35 (1,452)	−0.35	No	0.11
1-0	1-1	0.35 (16,398)	0.37 (3,333)	−0.02	No	0.40
1-1	1-2	0.27 (13,122)	0.36 (3,641)	−0.09	No	0.24
1-2	Strikeout	0	0.36 (3,204)	−0.36	No	0.09
2-0	**2-1**	**0.44 (9,444)**	**0.37 (1,230)**	**+0.07**	**Yes**	**0.47**
2-1	2-2	0.32 (11,232)	0.37 (2,388)	−0.05	No	0.22
2-2	Strikeout	0	0.35 (3,119)	−0.35	No	0.09
3-0	**3-1**	**0.63 (4,491)**	**0.42 (147)**	**+0.21**	**Yes**	**0.82**
3-1	**3-2**	**0.49 (7,425)**	**0.39 (1,073)**	**+0.10**	**Yes**	**0.31**
3-2	Strikeout	0	0.36 (2,462)	−0.36	No	0.08

Note. The boldface type identifies the situations in which the batter should take a pitch.

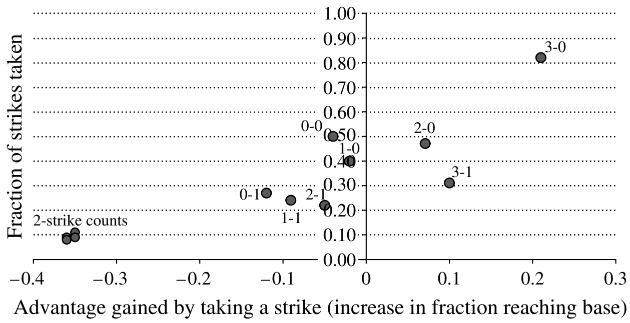
compared to putting the ball in play, whereas taking a strike on 3-1 increases the chance of reaching base by 10% compared to putting the ball in play. Despite Ted Williams' suggestion, taking 0-0 appears not to be a sound strategy, at least on average. Given that batters also should not take 1-0, the baseball strategy of "taking a strike" (not swinging until the pitcher throws his first strike) is not a good one in aggregate. Of course, these results represent averages over nine seasons and many different situations. These strategies may pay off with particular hitters, such as Ted Williams, and particular pitchers. However, given the large gain by taking, it is hard to envision many situations where swinging away on 3-0 is warranted, if the goal is to maximize the chance of reaching base. In order for not taking 3-0 to be optimal, a batter would have to be able to reach base at least 63% of the time he puts the ball in play, which we call the *in-play average* (IPAVG). The highest single-season IPAVG obtained by a Stanford batter during our study period was 0.477, attributed to Jed Lowrie (now with the Boston Red Sox). In Major League Baseball (MLB), the highest single-season IPAVG is 0.478, obtained by both Manny Ramirez in 2000 and Babe Ruth in 1923 (Bickel 2004a).

Based on this data, we also believe that our conclusions regarding 3-1 and 2-0 are robust. Batters would have to be able to get a hit 49% of the time they put the ball in play on 3-1 in order to justify swinging away. This level of performance has never been observed in MLB or in nine seasons at Stanford University. The same is true for the 2-0 count. In only 14 MLB player-seasons since 1913 (out of over 10,000) has a batter had an IPAVG greater than 0.440 (Bickel 2004a). We believe similar performance extremes are equally unlikely in college baseball.

Figure 4 plots how likely batters were to take a strike versus the advantage from doing so. 3-1 is a clear outlier; 2-0, 0-0, and 1-0 are taken more often even though 2-0's advantage is lower and taking 0-0 and 1-0 actually decreases the probability of reaching base. It appears as though batters do not take 3-1 often enough. Or perhaps, following Ted Williams, they take 0-0 too often.

How much of an advantage might a team hope to gain by taking pitches? As shown in Figure 3, this depends on the probability that the pitcher will throw

Figure 4 **Batters' Propensity to Take a Strike Compared to Benefit of Doing So**



a strike, p, and the chance that the batter can put in play a ball thrown for a strike, q. The former can be obtained from our database. The latter is harder to assess from our data because we do not know when the batters were taking. We do, however, know that batters were able to put only 40% of strikes in play on two-strike counts, in which case they were surely not taking. Therefore, for the sake of argument, assume $q = 0.4$ and consider the 3-0 count. Pitchers threw 61% strikes on 3-0 and therefore, referring to Figure 3, the probability the batter will reach base if he takes is $0.39 \cdot 1 + 0.61 \cdot 0.63 = 0.774$. If the batter does not take, his chance of reaching base is $0.39 \cdot 1 + 0.61 \cdot (0.40 \cdot 0.42 + 0.60 \cdot 0.63) = 0.723$, which is a difference of 0.051. On average, 2.3 plate appearances per game feature a 3-0 count. Thus, a team that always took 3-0 would gain an additional 0.12 runners per game. This is an 0.8% increase over the 14.9 base runners per game that teams averaged during our study period.

Table 2 presents this analysis for every count. A team that took every 2-0 pitch would gain approximately 0.11 base runners per game, which is an 0.8% increase in the number of base runners. Taking 3-0 and 3-1 produce similar increases, for a combined 2.3% increase in the number of base runners. Although this increase may seem small, elite baseball teams are closely matched and seek every possible advantage.

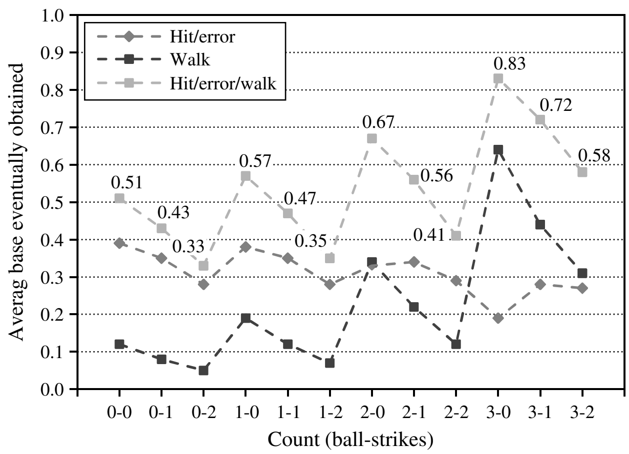
Table 2 makes clear how poor a strategy of taking 0-0 really is. Although the reduction in the chance of reaching base is only 0.009, every batter has an 0-0 count and teams average 39.1 0-0 counts per game. Always taking 0-0 would cost a team 2.4% of its base runners—almost perfectly offsetting the gain from taking 2-0, 3-0, and 3-1. In fact, 0-0 is one of the worst counts to take. Yet, it is the second most popular count on which to take a pitch (see Figure 4)! Although Ted Williams may have gained an advantage and influenced many batters chasing his dream, it does not appear to be a sound strategy in the aggregate. That being said, it is possible that certain undisciplined hitters who swing at bad pitches may benefit by taking 0-0 (and other counts). This is possible because these batters violate our assumption that the probability of a strike being added to the count is independent of their decision to take.

Table 2 **Benefit (Loss) of Taking a Pitch for Each Count,** $q = 0.4$

Current count	Probability of a strike (p)	Probability of reaching base if batter takes a pitch	Probability of reaching base if batter swings away	Gain (loss) by taking a pitch	Plate appearances per game	Runners gained (lost) per game	Change in base runners (relative to 14.9/game) (%)
0-0	0.57	0.367	0.376	−0.009	39.1	−0.36	−2.4
0-1	0.56	0.294	0.321	−0.027	16.9	−0.45	−3.1
0-2	0.49	0.138	0.206	−0.069	7.4	−0.51	−3.4
1-0	0.62	0.426	0.431	−0.005	16.8	−0.08	−0.6
1-1	0.62	0.335	0.357	−0.022	14.6	−0.33	−2.2
1-2	0.62	0.122	0.211	−0.089	11.7	−1.04	−7.0
2-0	**0.64**	**0.559**	**0.541**	**0.018**	**6.4**	**0.11**	**0.8**
2-1	0.67	0.422	0.436	−0.013	8.4	−0.11	−0.8
2-2	0.68	0.157	0.252	−0.095	10.0	−0.95	−6.4
3-0	**0.61**	**0.774**	**0.723**	**0.051**	**2.3**	**0.12**	**0.8**
3-1	**0.69**	**0.648**	**0.621**	**0.028**	**4.0**	**0.11**	**0.7**
3-2	0.76	0.240	0.349	−0.109	6.6	−0.72	−4.9

Note. The boldface type identifies the situations in which the batter should take a pitch.

Figure 5 Average Bases Eventually Obtained for Each Count



2.2. Maximizing the Expected Number of Bases Obtained

Does the strategy of taking 2-0, 3-0, and 3-1 hold up when we include the productivity of each hit? Let us reconsider our conclusions by examining average number of bases obtained on each count, thus giving more weight to doubles (2 bases), triples (3 bases), and home runs (4 bases). Figure 5 displays the average number of bases *eventually* obtained via a hit, an error, or a walk. For example, each plate appearance, which begins on 0-0, resulted in 0.51 bases on average. If a strike was thrown and the count went 0-1, then the average bases eventually obtained was decreased to 0.43.

Table 3 Decision Table for Taking a Pitch Based on Expected Bases Obtained

Current count	New count if batter takes a strike	Average bases eventually obtained if a strike is taken (B)	Average bases obtained if ball is put in play (C)	Difference between C and B (average bases)	Take a pitch	Fraction of strikes taken
0-0	0-1	0.43 (18,986)	0.46 (5,853)	−0.03	No	0.50
0-1	0-2	0.33 (8,314)	0.46 (3,559)	−0.13	No	0.27
0-2	Strikeout	0	0.43 (1,452)	−0.43	No	0.11
1-0	1-1	0.47 (16,398)	0.48 (3,333)	−0.01	No	0.40
1-1	1-2	0.35 (13,122)	0.45 (3,641)	−0.10	No	0.24
1-2	Strikeout	0	0.43 (3,204)	−0.43	No	0.09
2-0	**2-1**	**0.56 (9,444)**	**0.50 (1,230)**	**+0.06**	**Yes**	**0.47**
2-1	2-2	0.41 (11,232)	0.48 (2,388)	−0.07	No	0.22
2-2	Strikeout	0	0.43 (3,119)	−0.43	No	0.09
3-0	**3-1**	**0.72 (4,491)**	**0.56 (147)**	**+0.16**	**Yes**	**0.82**
3-1	**3-2**	**0.58 (7,425)**	**0.51 (1,073)**	**+0.07**	**Yes**	**0.31**
3-2	Strikeout	0	0.46 (2,462)	−0.46	No	0.08

Note. The boldface type identifies the situations in which the batter should take a pitch.

Table 3 is a decision table that details on which counts the batter should take a pitch based on the goal of maximizing expected bases. Again, taking 2-0, 3-0, and 3-1 deterministically dominates swinging away. The increase in the average bases obtained by taking a pitch on these counts translates into almost 0.3 extra bases per game—about a 1.3% increase. Furthermore, taking 0-0 is not wise and a team that did so would lose about 0.3 bases per game—again, almost perfectly offsetting the gains from taking 2-0, 3-0, and 3-1.

2.3. Maximizing the Chance of Getting a Hit

As discussed in §2, in certain situations the offensive team may be trying to get a hit and is not concerned with simply reaching base or maximizing the expected number of bases obtained. For example, late in a close game with runners in scoring position (second or third base) the offensive team needs to drive the runner in or at least advance him. If first base is unoccupied, a walk will fail to achieve this goal. In fact, it may be to the defense's advantage to intentionally walk the batter in this situation (Bickel 2004b). Thus, the offensive team needs to get a hit. Should it take pitches in this case? To answer this, we need to look at the chance of eventually getting a hit or an error for each count compared to getting a hit or an error if the ball is put in play. Table 4 displays these results.

Table 4 Decision Table for Taking a Pitch Based on Probability of Getting a Hit

Current count	New count if batter takes a strike	Fraction of batters eventually reaching base by a hit or an error if a strike is taken (B)	Fraction of batters reaching base by a hit or an error if ball is put in play (C)	Difference between C and B (change in chance of a hit or an error)	Take a pitch	Fraction of strikes taken
0-0	0-1	0.24 (18,986)	0.36 (5,853)	−0.12	No	0.50
0-1	0-2	0.20 (8,314)	0.37 (3,559)	−0.17	No	0.27
0-2	Strikeout	0	0.35 (1,452)	−0.35	No	0.11
1-0	1-1	0.23 (16,398)	0.37 (3,333)	−0.14	No	0.40
1-1	1-2	0.20 (13,122)	0.36 (3,641)	−0.16	No	0.24
1-2	Strikeout	0	0.36 (3,204)	−0.36	No	0.09
2-0	2-1	0.22 (9,444)	0.37 (1,230)	−0.15	No	0.47
2-1	2-2	0.19 (11,232)	0.37 (2,388)	−0.18	No	0.22
2-2	Strikeout	0	0.35 (3,119)	−0.35	No	0.09
3-0	3-1	0.17 (4,491)	0.42 (147)	−0.25	No	0.82
3-1	3-2	0.16 (7,425)	0.39 (1,073)	−0.23	No	0.31
3-2	Strikeout	0	0.36 (2,462)	−0.36	No	0.08

If the offensive team needs a hit, it should not take on any counts—*especially* 3-0 and 3-1 (and of course, the two-strike counts). Compared to putting the ball in play, taking a strike on 2-0, 3-0, and 3-1 decreases the chance of getting a hit by 15%, 25%, and 23%, respectively. Putting the ball in play always increases the chance of getting a hit, even though it may lower the chance of reaching base or the average number of bases obtained, because it takes away the possibility of the walk. Taking 3-0 is especially bad when considering that there is nearly a 60% chance of getting a fastball in the strike zone and essentially no chance of getting any other pitch type in the zone.

3. Conclusion

Good decision making can help baseball teams improve their performance, but differing objectives yield differing recommendations. If teams wish to maximize their probability of reaching base or their expected number of bases, then they should take a pitch on the 2-0, 3-0, and 3-1 counts. On the other hand, if they seek to maximize the probability of a hit, then they should not take a pitch on any count.

The conventional wisdom of taking 3-0 is borne out by our analysis. In addition, we prescribe taking 2-0 and 3-1 if the batter's objective is to maximize the chance of reaching base or the expected number of bases he obtains. In contrast to 3-0, as can be seen in Figure 4, batters do not seem to take 2-0 and especially 3-1 with enough frequency. Although taking 0-0 was considered good strategy by one of the game's greatest hitters, it does not benefit teams in aggregate at the collegiate level. Future research will test these conclusions at the major league level.

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