

Zak Weimer

Mr. Prentice

Exhibition

4/12/2024

## **Baseball Statistics**

Have you ever been intrigued by a baseball game, only to be puzzled by a seemingly random stat or a number with a “+/-” symbol in a graphic about the game’s odds? If so, you are not alone, as statistics become increasingly complex and specific. Baseball statistics are among the most widely used tools by athletes, sports bettors, and team executives.

Before we get into what baseball statistics (from this point on, they will be referred to as “stats”) are used for, we first need to understand what they are. Baseball stats have long been an integral part of the game for many years, especially nowadays with the “statcast era” allowing people to see things such as a pitch’s spin rate or a home run’s launch angle. However, there are many stats to dive into, both simple and complex. To start, let us take a comprehensive look at simple baseball stats. Examples of stats that may come across as “simple” include batting average and earned run average. However, even these may seem complicated and may require some explanation. So, here are some of the most common baseball stats and what they mean.

1. **Batting Average (AVG):** This represents how many times out of a thousand a player will get a base hit. Fans can find this number by dividing the number of hits by the number of at-bats (Walks, Hit-By-Pitches [HBP], and Errors do not count as an at-bat in this formula). Typically, the best players have a batting average of .300-.330, meaning they get hits 30% to 33% of the time. Walks, hit-by-pitches, and errors do not count toward one’s batting average, bringing it down gradually (May).

2. Earned Run Average (ERA): Arguably the most crucial stat for pitchers (Rider), this represents how many runs a pitcher will give up in a full nine-inning game. This number does not include the runs from batters who reached on a defensive error, walk, or HBP, known as unearned runs. The best pitchers can keep their ERAs to 1.50 or less, but an ERA of 3.50 is usually considered the threshold for a sound ERA (“Standard Stats | Glossary | MLB”).
3. On-base percentage (OBP): This is similar to batting average, but instead of measuring a player’s hits, it measures how many times out of a thousand a player gets on base. It represents the chance a player will safely reach base and is almost always higher than AVG because it includes things such as walks, HBP, and errors, which contribute positively to your OBP (May).
4. Slugging Percentage (SLG): SLG represents the number of bases a player records per at-bat. Unlike OBP, slugging percentage deals only with hits and does not include walks and hit-by-pitches. SLG is different because it just uses hits, not all at-bats. Also, not all hits are treated equally. The more extra-base hits a player hits, the higher his SLG will be (“Standard Stats | Glossary | MLB”).
5. On-Base plus Slugging (OPS): This is just OBP plus SLG. The best players can have an OPS over 1.000, although .750 is considered a threshold for a good OPS. It is a better representation of a batter’s hitting skill than AVG. This stat and OBP became mainstream when *Moneyball*, both the novel and the movie, became famous (Duvall; May).

The stats above are an excellent first step toward understanding baseball more. However, they do not tell the whole story. For that, we need more complex stats, also called sabermetrics. The Society of American Baseball Research (SABR) defines *sabermetrics* on its website as “the

search for objective knowledge about baseball (“A Guide to Sabermetric Research”).” However, a more accepted definition of the word is “detailed statistical analysis of baseball data (“Sabermetrics Definition & Meaning”).” Complex baseball stats did not exist until the beginning of the “Statcast Era,” which did not exist until the mid-2010s. These are important because they allow you to understand more about a particular player or team. Here are a few essential complex sabermetrics.

1. Wins Above Replacement (WAR): The easiest way to see a player’s immediate value. Imagine you are a coach with two catchers: Jimmy, who just got promoted from the Minor Leagues, and Dom, a former All-Star. You want to see how much more valuable Dom is than Jimmy. To do so, you would look at Dom’s WAR. If putting Dom in gets you more wins than putting Jimmy in, then Dom’s WAR will be positive, and Jimmy’s WAR will be harmful, and vice versa (Rider). WAR also accounts for defense and is usually stadium-independent, meaning that the number will take into account different quirks about stadiums. For instance, Coors Field, home of the Colorado Rockies, is very high in elevation, so more home runs are hit there due to the thinner air. A confusing aspect of this stat is that different websites will have different values for WAR- for example, FanGraphs uses Fielding Independent Pitching (see below) as a part of their calculation of WAR for pitchers, whereas Baseball-Reference uses ERA. These websites will spit out different numbers (“Advanced Stats | Glossary | MLB”).
2. OPS+: This is an upgrade over OPS. Since league offense quality can vary yearly, gauging how good a player is can be challenging. This stat helps with this- it measures how good a player’s OPS is when adjusted for factors like altitude or the stadium the

player is playing in. The league average is always 100. If the player is above average, the OPS+ will be over 100, and vice versa (Duvall; “Advanced Stats | Glossary | MLB”).

3. **Batting Average on Balls in Play (BABIP):** This stat is an upgrade over the Batting Average. Instead of measuring how many times a player will hit safely for all at-bats, it measures how many times a player hits safely exclusively from balls hit in play (all outcomes are directly related to how the defense performs [unlike home runs or strikeouts]). Essentially, it is AVG, but instead of dividing by the number of at-bats, you divide by the number of balls in play that the player hits (Duvall).
4. **Field Independent Pitching (FIP):** Here, stats go from somewhat complex to highly complex. FIP is an excellent example of this- it generally tells you how successful a pitcher has been when it comes to striking guys out, not giving up walks, and not allowing home runs. It does a horrible job of accounting for literally everything else. Sometimes, this can be a good indicator of a pitcher’s luck, but usually, it is advised not to get too carried away with this stat (Duvall; “Advanced Stats | Glossary | MLB”).
5. **Weighted On-Base-Average (wOBA):** wOBA is a version of on-base percentage that accounts for how a player reached base instead of simply considering whether a player reached base in the first place. The value for each method of reaching base is determined by how much that event is worth in terms of projected runs scored. For example, a home run is worth more than a single. (Duvall).
6. **Defensive Runs Saved (DRS):** This stat indicates how many runs a player saved or cost his team in the field compared to others in his position. It is one of the only stats that evaluates a player’s value at defense. It considers errors, range, outfield arm strength, and

double-play ability, which most players should have, given they are professionals and get paid millions of dollars (“Advanced Stats | Glossary | MLB”).

7. The Pythagorean Win Expectation (PYTHAG): Celebrated statistician Bill James developed PYTHAG. This formula attempts to determine the number of games that a team should have won based on its total number of runs scored versus its number of runs to better forecast that team’s future outlook (“Pythagorean Winning Percentage | Glossary | MLB”) or whether a team overachieved or underachieved in a year.

This is the formula. Fans should note that different websites use different exponents to get more accurate results (Winston et al. 3-11):

$$\frac{(\text{runs scored}^2)}{([\text{runs scored}]^2)+([\text{runs allowed}]^2)}$$

Understanding baseball statistics is crucial in understanding their everyday use. Many different people use baseball statistics every day. Team executives, sports bettors, and sometimes even the average fan use baseball statistics to understand better team performance, odds on a game, or even just how good their favorite player is doing. At every level of baseball, from MLB to Little League, coaches and executives are looking at stats to maximize their team’s chances of winning (ok, maybe not *that* much at Little League). Baseball does not have just one professional league; it has numerous leagues across the country and the world. In baseball (any sport could follow this formula), there is one tried-and-true formula for team success from a performance and financial standpoint.

First, you need to have a winning team. Is going to a game any fun if your team gets blown out all the time? You need a winning, entertaining team to get the fans to want to spend their hard-earned money attending your team’s games.

Secondly, you need the “big guns.” You need absolute superstars, guys who everybody knows. Having those superstar-level guys on your team will help you attract even more fans, including those who maybe do not know much about your team’s particular sport but rather that one superstar athlete.

Lastly, you need guys with big, easy-to-promote stats. These include hitting long home runs, throwing 100+ MPH, and electric streaks a player may be on, like a 15-game hit streak, where a player will have hit safely 15 games in a row, which is really rare. These will attract fans because they are entertaining for them.

This formula works in many leagues, including top leagues like the MLB, NBA, NFL, and any league with a big audience and top-tier technology. For more minor leagues, such as international leagues worldwide in places like Germany, having access to an audience and high-end tracking metrics is harder. That is why many leagues, like the Baseball-Bundesliga, Germany’s top-end baseball league, *only care about selling tickets*. Sponsorships, promotions, new fads, new players, whatever it takes to fill seats will often be the only feasible route to financial stability. If a team cannot keep up with the cash, they will have to rely more and more on sponsorships to stay afloat, or the whole team will collapse altogether. This new approach to professional sports may seem like it is taking away from the actual game and solely focusing on money and financial stability, which has garnered mixed feelings. Some people despise it with their lives, and some joyfully welcome it with open arms. Either way, do not be surprised when you see that “30-second” ad breaks seem *slightly longer than last year* (Rider).

Just because team executives benefit from juiced-up stats does not mean others, including sports bettors, cannot. In sports betting, you will find overs, under, money lines, and parlays here. It is a confusing world, with tons of terminology to learn and understand. However, it is

straightforward once you look into it. There are four main types of bets: the Moneyline, the spread, the over/under, and parlays. The moneyline is the most common type of betting, and when you see numbers like -250 or +405, that is the moneyline odds. Imagine a scenario where one team has -105 odds to win a game. To win your bet, you would have to bet \$105 to win \$100, assuming the team wins. Looking at it the other way around, if a team has +205 odds and wins the game, if you bet \$100 on them and they won, you would win \$205.

The spread works differently from the money line. Often, you might hear the term “covering the spread” and have no clue what it means. Imagine you see odds for a baseball game listed as BAL -3.5, NYY +3.5. This means the Baltimore Orioles are 3.5-point favorites (in baseball, referred to as the “run line”) over the New York Yankees, who, according to the odds, are 3.5-point underdogs. To “cover the spread,” the Yankees must do one of two things: Either win outright or lose by three or fewer runs. Since they did better than what the sportsbooks thought they would do, you would win money if you bet on them. Similarly, the Orioles would need to win by four or more runs to cover against the spread, or you would lose your bet.

The third type of bet is the Over/Under. The Over/Under is a metaphorical coin toss on whether a certain amount of something will go over or under a specified amount. Often, this amount is a decimal point to ensure that there are no scenarios where someone would bet the exact amount of time something happened (i.e., betting the over on three runs, only for three runs scored by both teams). In most major American sports, the Over/Under is for the total number of points scored by both teams in a game, although other, less common O/U bets follow similar logic.

The last primary type of bet is a parlay. Word of advice: If you are a beginner, avoid being concerned with all the parlays! A parlay is a combination of two or more bets in hopes that

they will all cash out for a huge money prize. The only problem is that there is a very low probability of all three bets cashing out. Frequently, one or two of the bets will cash out, but because a third one did not, you would not win anything and would be very disappointed (Miller and Davidow; Winston et al.).

Now that we know what types of bets exist, we can explain how sports bettors use stats to influence their decisions. Say one of your parents was considering a baseball game to bet on, not because he has a severe gambling addiction (BUT if he does, you can call 1-800-GAM-BLER [426-2537] for help, guidance, or any other assistance [“About the National Problem Gambling Hotline”]), but because it is a way for him to enjoy his hobbies. If he is smart, he would not consider games where he already knows who will win and would choose games between two very even teams since it is more likely for the underdog to win and for his bet to cash out. However, how would he know what to bet on, such as players who will get an extra-base hit? He would look at a player’s slugging percentage (remember earlier?) or BABIP if he wanted to. Or how about a team’s odds to win a division? This is where PYTHAG plays here- to win a division, you have to win the most games (Peta; Winston et al.). Frequently, newcomers are not as bright, and because they are so excited to make it big, they will bet tons of money on the immense odds without much radical thinking, leading to financial losses.

You could find a stat for every type of bet out there, such as an over/under on a pitcher’s strikeouts or a “prop bet” (a bet that predicts if something- usually oddly specific- will happen), such as the odds of a pitcher making a fielding error. Either way, no matter what sport you enjoy or bet on, if you look at stats before you finalize a pick, it is possible that you would stop yourself and think your decision through- you might have just saved yourself a fortune (Peta).

Since the turn of the century, technology has drastically changed how people view sports. What used to be a simple scene has since ballooned into a complex, sprawling world of quirky numbers and advanced sabermetrics that tell you so much about a player or team. Unsurprisingly, sports statistics are some of the most-used tools used by athletes, sports bettors, and team executives alike- they tell you so much and may be the key to your success, whoever you may be. As technology advances, you can win big, pushing the limits of what is humanly possible.

## Works Cited

- “About the National Problem Gambling Helpline.” *National Council on Problem Gambling*, 22 Nov. 2023,  
<https://www.ncpgambling.org/help-treatment/about-the-national-problem-gambling-helpline/>.
- “A Guide to Sabermetric Research.” *Sabr.org*, <https://sabr.org/sabermetrics>. Accessed 19 Apr. 2024.
- Davidow, Matthew, and Miller, Ed. *The Logic of Sports Betting the Logic of Sports Betting*. Independently Published, 2019.
- “Definition of SABERMETRICS.” *Merriam-webster.com*,  
<https://www.merriam-webster.com/dictionary/sabermetrics>. Accessed 19 Apr. 2024.
- Depth Charts. “Standard Stats.” *Mlb.com*, <https://www.mlb.com/glossary/standard-stats>. Accessed 26 Jan. 2024.
- Depth Charts. “Advanced Stats.” *Mlb.com*,  
<https://www.mlb.com/glossary/advanced-stats>. Accessed 26 Jan. 2024.
- Duvall, Alex. “10 Advanced Baseball Stats You Should Know.” *Royals Farm Report*, 6 Jan. 2022,  
<https://royalsfarmreport.com/2022/01/06/10-advanced-baseball-stats-that-you-should-know/>.

May, Jeffrey. "Baseball Statistics Explained: What Is OPS, WHIP, ERA, OBP, SLG, Etc.?" *AS the USA*, 4 Oct. 2023,

<https://en.as.com/mlb/baseball-statistics-explained-what-is-ops-whip-era-obp-slg-etc-n-2/>.

Peta, Joe. *Trading Bases*. Berkley Books, 2014.

Rider, David Personal Interview March 18, 2024

Winston, Wayne L., et al. *Mathletics: How Gamblers, Managers, and Fans Use Mathematics in Sports, Second Edition*. Princeton University Press, 2022.